

COMMON
BRITISH
ANIMALS

KATE M. HALL

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Egyptian Fresco in the British Museum. Hunting cat retrieving waterfowl. XVIIIth Dynasty: about 1450 B.C. (Photo. by W. A. Mansell & Co.)

NOTES ON THE NATURAL HISTORY
OF
COMMON BRITISH ANIMALS

AND SOME OF
THEIR FOREIGN RELATIONS

VERTEBRATES

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TO
E. W. O.
IN AFFECTIONATE GRATITUDE

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PREFACE

TOPSELL, in his 'Fourfooted Beasts,' says:
"But, gentle reader, as thou art a man, so thou must consider since Adam went out of Paradise, there was never any that was able perfectly to describe the universal conditions of all sorts of beasts. . . . But for my part which write the English story, I acknowledge that no man must look for that at my hands, which I have not received from some other."

It is to those "others" that this little book is entirely indebted, and it claims no originality.

I know that time and opportunity are often wanting, for reading the larger standard works on Natural History, to those engaged in the busy routine of elementary teaching. It has been my endeavour to put into this little book such information about well-known animals, which, from my past experience, I believe to be of greatest service in interesting boys and girls in our Common British Animals.

Of those "others" to whom I am indebted, there is a long list, but at the head of it stands Mr. J. G. Millais, who gives such excellent descriptions and pictures of our native beasts in his 'British Mammals.' Mr. Millais' descriptions are the first-

hand observations of a naturalist given in language which may be understood by all, and the illustrations by Thorburn, Douglas English and the author are unsurpassed. If the quotations I have made from this work tempt my readers, as I hope, to consult Mr. Millais' volumes for themselves, I have not written in vain.

I have also made use of Mr. F. E. Beddard's 'Mammalia,' in the Cambridge Natural History Series, and have based such classification as was necessary on that given by Mr. Beddard. I have found much to help me in the British Museum Guides and in Prof. Ridgeway's 'Origin and Influence of the Thoroughbred Horse.'

My thanks are due to Dr. A. C. Haddon for so kindly reading through the proof sheets and for many helpful suggestions. I am also indebted to those friends who have helped with the illustrations, especially to Mr. H. C. Wood, and my kinsman, Mr. H. R. Hall.

Finally the book owes a deep debt of gratitude to the sympathy and monumental patience of its good publisher, Mr. R. Evan Adlard.

K. M. HALL.

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COMMON BRITISH ANIMALS

CHAPTER I

THE CAT

I SHALL try in this little book to tell something about the common animals of Great Britain, and a few of their well-known foreign relations, the knowledge of which may give young naturalists greater pleasure and interest in the familiar animals they may know in their own homes, see in the streets, when on holidays meet with in the meadows, farm-yards, or woods, or see in the Zoological Gardens.

“Why have you begun with the cat?” some may say. “Why not the horse or the dog?” Well, everyone keeps, or has kept, a pet cat, and pussy is a member of a very large, ancient, and important family, a fact of which she is fully aware, as anyone can see who watches her pride and self-satisfaction in the grace, dignity, and elegance of her movements and attitudes, and by her perfect indifference to your opinion of her. She will condescend to associate with you on friendly terms in return for certain comforts in which her soul delights, namely

milk, and a warm soft bed, but become your devoted friend and slave, as the dog loves to be, never!

This is without doubt the general cat character, though many of us who have had our favourite cats could tell stories of them proving the personal attachment of our pets. Nevertheless, the cat is at



FIG. 1.—Common Tabby Cat, striped variety. (Photo. from life by H. C. Wood.)

heart a wild animal, an untamable savage, who lives with us, now, for his own convenience, but will often leave us and take to the wild life of his ancestors in the woods. Very savage and menacing pussy becomes, reminding us very little of our friend curled up on the hearthrug, as he sits on the branch of a tree glaring at us with large yellow eyes and laid ears, like the Cheshire Cat in 'Alice in Wonderland.'

He has assumed the habits and manners of his forbears, and we realise, as we look at him, what kind of beast the wild cat was. We know that wild cats were living in England at the time when our ancestors were getting their food by hunting, their only weapons being rough pieces of flint. The fossil bones of wild cats and the cave lion and the sabre-



FIG. 2.—Common Tabby Cat, blotched variety. (Photo. from life by W. F. Taylor.)

toothed tiger have been found in various parts of England, together with these rough-hewn flints.

Now, the wild cat is extinct in Britain, except, perhaps, in the forests of the west of Scotland, where single specimens have from time to time been seen. The so-called wild cats in the south of England are really domestic cats which have taken to a wild life. Possibly a few wild cats may have

existed before the custom of protecting game such as partridges and pheasants prevailed, but these would be speedily killed by the gamekeepers, and no doubt their skins were stuffed and put into the local museums, where many specimens are to be seen.

Those who have a chance of seeing a wild cat



FIG. 3.—Persian Cat. (Photo. from life by Miss Devitt.)

in a museum should look well at it and compare its colour, its stripes, the shape of the tail, markings on the tail and the shape of its head with these points in their own pussy at home.

The late Prof. Mivart, who has devoted a large volume to the study of the cat, believed, as many others do with him, that our domestic cat is not the English wild cat tamed, but that our tame cats were

introduced to the west from the east. The ancient Egyptians revered cats and embalmed their bodies when they died. They probably obtained their cats from Persia and Babylonia, and put them to various uses, one of which you may see in a remarkable fresco in the Egyptian Gallery at the British



FIG. 4.—Cat hunting Pheasant. Cretan fresco of the first late Minoan period (about 1600 B.C.)

Museum, showing the cat used for hunting (frontispiece). We are also able to reproduce a very interesting fresco found at Phaistos of a cat stalking a pheasant (Fig. 4). The Egyptians worshipped a cat goddess and made sacred statues and emblems of the cat. Some of these you will also see in the British Museum, and you will notice that the Egyptian cat



FIG. 5.—Bronze figure of the Egyptian cat-goddess, Ubastet or Bast. British Museum. About 1000 B.C. (Photo. by Artists' Illustrators, Ltd.)

was longer on the fore-legs and had a longer neck than our cats have. You may look at all the statues, big and little, in the British Museum, and there are hundreds of them, some only $1\frac{1}{2}$ inches high, and most of them more than 2000 years old. In all you will see the same long narrow body, long fore-legs, and



FIG. 6.—Native Egyptian kitten. "Sphinx." (Photo. from life by H. R. Hall.)

long neck. Now, the Egyptians were excellent artists, and these statues were doubtless very fine pictures of their cats, while they exactly depict the form of the cat living in Egypt in the present day. It is sandy yellow in colour like the sand of the desert, and its long narrow body suggests "speed," and that it hunts in the open, securing its prey by



FIG. 7.—Bronze figure in the British Museum of the Egyptian goddess Ubastet or Bast, cat-headed, holding a sistrum (musical instrument); at her feet are kittens. About 1000 B.C.

long quick leaps and bounds rather than by stealthy stalking through the woods which we know is the habit of our cats. It seems to me easier to see the form of the English wild cat in our cats than it is to trace the form of the Egyptian cat, but this may be due to interbreeding with the wild cat and to the effect of the changed surroundings.

The familiar name Puss is said to be derived from "Bast," the name of the Egyptian cat goddess. She is represented as a cat with pointed ears. With Bast, the cat goddess, is sometimes confused Sekhet, the lioness goddess, who may be distinguished by her rounded ears. Both were associated with night, but Bast presided over the fashions, and fashionable women worshipped her. The pots for eye paints were often made in the shape of a cat. There is some correspondence between Bast and Aphrodite. Sekhet was associated with the moon. She typified heat and flame and was the goddess of war.

Tame cats it is said were brought from Egypt to Greece and Rome and thence to Britain. In the middle ages they were so much prized and so scarce that they received special State protection.

I have chosen the cat as a familiar type of back-boned flesh-eating animals, which feed their young on milk, in other words, because it is a flesh-eating mammal easily accessible to everyone for study.

To the big group of mammals belong all the most important animals, including man, who differs from the rest mainly by his capacity to keep his body erect. Cats and their relations are flesh-eating mammals. Seals and walruses, whales and porpoises

are flesh-eating mammals living in the sea. Sheep and deer are grass-feeding or herbivorous mammals. The manatee and dugong are herbivorous mammals living both in fresh water and the sea. Rats and mice are gnawing mammals.

There are other groups of backboned animals which do not feed their young with milk; some of these have warm blood, while others have cold. We shall find that the building plan of all backboned animals is the same, their forms varying only in detail. First, there is the box or trunk containing the heart, lungs, stomach, and other organs; this box is placed on four legs. Along the top of the box runs the backbone, a series of thick hollow bones which contain and protect the marrow or spinal cord. These bones project beyond the box at the back to form the tail, and also extend beyond the box in front forming the neck, which carries the head, a smaller box containing a special portion of the spinal cord called the brain, the central nerve office whence messages are sent out to the limbs and all the organs of the body. Upon the head are placed such organs as the eyes, nose and mouth, which carry messages to the brain. This, roughly, is the plan Nature has adopted in making all the backboned animals. No single plan prevails in the construction of animals without backbones. There is much more variation in their design.

The backboned animals have usually two rings of bones round the trunk: one called the shoulder girdle where the arms or fore-legs are attached, and another called the hip girdle carrying the hind legs.

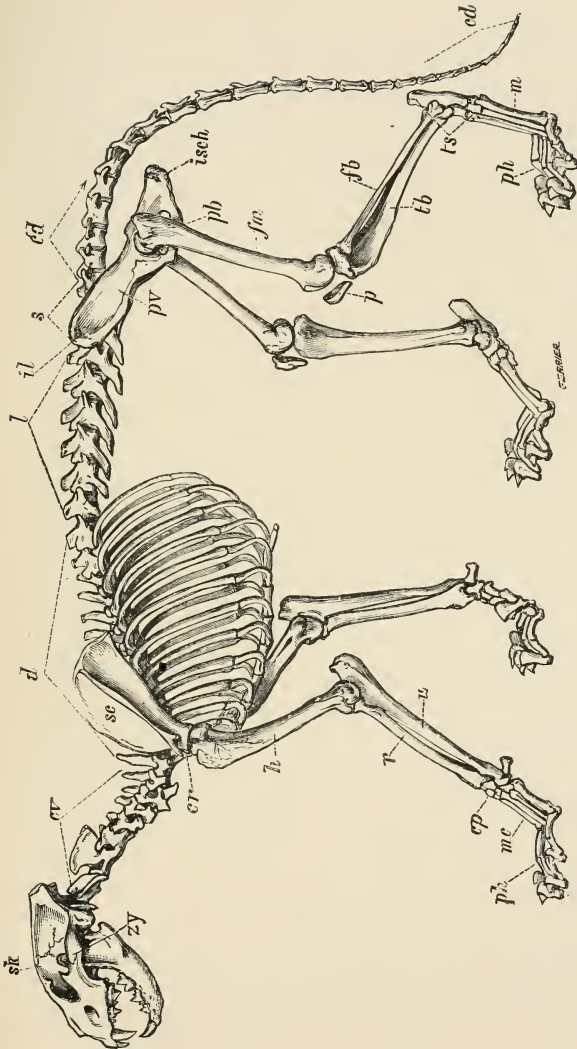


FIG. 8.—Skeleton of a Lion. *sk*, Skull; *zy*, zygoma; *cv*, cervical vertebrae; *d*, dorsal vertebrae; *l*, lumbar vertebrae; *il*, ileum; *s*, sacral vertebrae; *cd*, caudal vertebrae; *sc*, scapula; *cr*, coracoid process; *h*, humerus; *r*, radius; *u*, ulna; *cp*, carpus; *mc*, metacarpus; *ph*, phalanges; *pv*, pelvis; *pb*, pubis; *isch*, ischium; *f*, femur; *p*, patella; *fb*, fibula; *tb*, tibia; *ts*, tarsus; *m*, metatarsus.

You will be able to see that puss has all these parts. You can feel her backbone running along the top of her back and the bones in her tail, head, and legs, but it will be more difficult to feel the girdles of bones; however, you can feel your own hip and shoulder girdles. Just below your collar you have a bone called the "collar bone," one of the bones of your shoulder girdle which helps to keep the top of your chest extended. Now this bone being absent from the cat's shoulder girdle she is consequently very narrow chested. A narrow chest is an advantage to her, because she has a very small surface to push through the air, and therefore can move with greater speed. In the same way you try to make yourself as narrow as you can if you want to ride quickly on a bicycle. Puss can also squeeze herself through surprisingly small apertures. You know, it is said, that if a cat can get her head through any hole she can get her body through it. A protecting and movable cage of bones called the ribs surrounds the lungs and heart. The arms and legs of all backboned animals are constructed on the same plan: one bone from the shoulder to the elbow, two from the elbow to the wrist. A varying number of bones form the wrist, to which are connected the bones in the palm of the hand, and these support the bones of the five fingers. Several mammals walk, like the cat, on their toes, while others, such as the bear and the monkey, walk on the sole of the foot and palm of the hand, but they do not all retain the five toes, as we shall see later.

The number of the cat's toes and fingers is easy to count.

The greater number of mammals are more or less thickly covered with hair, as the cat is ; while a few, such as the whales, manatee and dugong are almost hairless. The spaces between the hairs are filled with air, which, being a non-conductor of heat, prevents loss of heat from the body, and thus assists to maintain the temperature of the warm-blooded animals, which is always considerably higher than the air or water in which they live.

The characteristics we have mentioned the cat shares with all other mammals, but it possesses certain marked features which distinguish it and its relatives. The more you look at your cat and watch its movements, the more you will enjoy the beauty of its form, so admirably adapted to its mode of life in a wild state, and you see how perfectly it is endowed with weapons both for defence and for capturing its prey.

Cats are flesh-eaters, preferring prey they have themselves hunted to any that is killed for them. The teeth of flesh-eating mammals are recognised at once by their sharp cutting edges, with points on them which hold the food, while the edges working one on the other cut the flesh, as a pair of shears would.

If you look into pussy's mouth you will find she has six incisor teeth in the upper and lower jaw where you have four, but they are very small and are only used for gnawing flesh off the bones, in which process she is greatly assisted by her rough

tongue, which acts like a nutmeg-grater. Like you, she has two canine teeth in each jaw, but for her size these are very large and strong. Beyond the canines there are two double teeth, called premolars, on each side in the upper jaw, and three on each side in the lower jaw, while you have four in the upper jaw and four in the lower. Behind the premolars there is one molar on each side in both jaws. When you have your full complement of teeth you will have three molars on each side in the upper and lower jaws, or six in all. Thus you will see the cat has—

$$\frac{3}{3} \text{ I. } \frac{1}{1} \text{ C. } \frac{2}{3} \text{ Pm. } \frac{1}{1} \text{ M. } \frac{14}{16} = 30.$$

Man has—

$$\frac{2}{2} \text{ I. } \frac{1}{1} \text{ C. } \frac{2}{2} \text{ Pm. } \frac{3}{3} \text{ M. } \frac{16}{16} = 32.$$

All mammals have two sets of teeth: the first set, which is shed, are called “the milk teeth”; the second the “permanent teeth”; but, alas! how few of us now find that they are aptly named.

The order of mammals to which the cat belongs is called the Carnivora, but there are other flesh-eating mammals, which we shall consider later, namely, the seals, sea-lions, and walruses, etc., whose bodies are as well adapted for an aquatic life as the tiger's is for his home in the jungle. When you first look at the seals and sea-lions in the Zoological Gardens you may not see much resemblance between the sea-lion and the cat, but as you watch him you will notice that he is covered with hair, which is the usual mammalian covering. Like the cat he has strong

whiskers round his mouth, and if he opens his mouth you will see his sharply pointed cat-like teeth. Should you happen to be calling upon him at his dinner hour, you will see him enjoy his meal of fish. If you ask the keeper he will tell you that the sea-lion's body is as warm as yours, and that there is nearly the same difference of temperature between your body and the air you are walking about in, as there is between that of the sea-lion's body and the water he is swimming in so gracefully. But what an ugly, awkward fellow he is on land! No cat is ugly or awkward, but she is a poor hand in the water, though tigers are said to be excellent swimmers.

It seems ridiculous to say that the sea-lion's flippers or his tail are like the cat's legs and tail, but if you look at the skeletons in your nearest museum you will see the building plan is the same. Skeletons and bones are thought to be very dry, uninteresting things, and so they are if we attempt to study them by themselves, but, when looked at as the structure on which the living machine is worked, they live too, and we are fascinated to find out what variation of her plan Nature has adopted to fit the particular form of the animal, we are studying, to the surroundings in which it is destined to pass its life. We know that the building plan of all animals with bones is exactly the same, and that the difference of form is produced only by varying the size and shape of some of the bones, and sometimes by leaving some out.

We have never used the cat except as a means of ridding our houses of mice, and sometimes, in rare

cases, of rats, but the Egyptians, as we have seen, used her for hunting, as the Chinese and Japanese have done. Her keen senses, especially of seeing and hearing, her light mobile body guided by her wonderful intellectual capacity, and her almost unwearying patience make her the very princess of hunting ; but she is by no means disposed to give her services and therefore is not easily trained, but she will hunt your mice preserves for you, on her own account, and thus unwittingly has proved herself of great service to man.

You would hardly think that she controls to a large extent the yield of red clover, but so it is. The seed of red clover is set, or given its growing power, by humble-bees, which carry the pollen from one flower to another, and thus it follows the more humble-bees there are, the more good clover seed there is ; but field-mice are very fond of eating humble-bees, and their numbers would be greatly reduced, if it were not for the cats, who hunt the mice. This is an old story now, but it is a true one. It illustrates very well how much need there is for knowledge of the habits and ways of animals. For, by thoughtlessly destroying and equally by thoughtlessly sparing the lives of certain creatures we are upsetting an order of Nature most essential to our well-being. Thus, through ignorance, the rook, the kestrel, the owl, the grass snake, the slow-worm and many other useful animals are destroyed ; by which means we spare the lives of vast numbers of rats, mice, voles, slugs, wire-worms and other destructive grubs.

Rolled up on the hearth-rug with her nose carefully covered by her paws you may see pussy's ear moving. She seems to hear the smallest movement of a mouse even in her sleep. The ears are large and can be turned from side to side, so as to face the direction of the sound, and they are also lined with hairs, which help to catch the sound-waves. Her eyes are large and round, and the pupil or opening in the eye, which all mammals have the power of making larger or smaller, without knowing it, according to the amount of light which falls upon the eye, in a bright light becomes very small. Pussy's is a mere slit extending across the eye from above downwards. In the dark the opening becomes round and seems to be as large as the coloured part of the eye.

The sense of smell is not nearly so keen as in the dog, but the cat has a very fine sense of touch in the long hairs or whiskers on the upper lip. Some cowardly people, who find amusement in thoughtless cruelty, I have known to cut these whiskers, or even to cut off a kitten's tail. The amusement derived from such acts must be of a most transitory nature, but the distress brought upon the poor cat is most painful and lasting.

The colour of the fur of cats varies considerably, but the ground colour of the wild cat's coat was some shade of grey, sometimes a blue-grey, sometimes more sandy with dark brown or black markings. These markings are streaks running along the body, but not the whole length except one from the head along the middle of the back; there are also transverse stripes and spots and cloudings. It is good

practice to write down an exact description of the colour and markings of your cat. The commoner tame cats are generally described as tabby, black, white, or sandy. In the fur of the black and sandy cats traces of the spots or stripes are always to be found. Like most animals the fur is lighter underneath than on the back. An excellent series of specimens in the Natural History Museum, South Kensington, illustrates the markings of the common domestic cat.

The tails of cats vary in shape. Most of them have tapering tails, but sometimes the more cylindrical tail of the wild cat may be seen. In the fur of the tom-cat the colour and markings are generally more pronounced than in that of the female, and his head is broader and body more muscular, but he is not, in my experience, so alert or so keenly intelligent.

The cat stalks its prey in a masterly manner, which it would be well for scouts to study and make note of. Its extreme silence and patience are remarkable, and in great contrast to the methods adopted by the dog. The silent tread of a cat stepping daintily on velvet paws is proverbial. Having come within measurable distance of her prey she pounces upon it with long leaps and bounds, which her long hind-legs and the extraordinary elasticity of her body enable her to make. She falls on the tips of her fingers and toes and at once pins her victim with her sharp nails or claws. If we were to attempt to make such leaps and fall on our hands we should break our collar-bones, but pussy has no collar-bone to break.

Those velvet paws cover her most deadly weapons, her claws, which even the well-fed fireside cat is always careful to keep clean and sharp, using the legs of your best table for the purpose. The points of these claws are as sharp as needles, as some of us know to our cost. If they were not hidden away the claws would become blunt by contact with the ground as the dog's claws are. Unlike our nails, which are immovable, the cat and her relations have sharp nails worked by two sets of muscles, one of which extends the claws, thus forming the velvet paw into a murderous weapon, and the other draws the claws into their sheaths of skin.

The cat has five fingers on her fore-legs or arms, but the thumb you will find raised above the level of the other fingers. On her hind legs she has but four toes.

Her elbow-joint is bent so as to enable her to thrust her arms forward when leaping, and the ankle and hip-joints are bent to the same end. In crouching she often lays the whole of her foot, to the ankle-joint, on the ground. If you try to draw her legs and arms, and then beside your sketch make a drawing of the legs and arms of a horse or cow, you will find that wrists and elbows, ankles and hips, do not always bend in the same way.

We may assume that the cat has within recent times been a native wild animal in Britain, and it is occasionally met with in the forests of the west of Scotland, but cats have no near relatives in Britain now. Their relations for the most part inhabit the hotter climates of Asia and Africa, though the tiger

is found as far north as Siberia, and the ounce or snow-leopard inhabits the cold tableland of Tibet.

In Europe the cat family is represented only by the wild cat and the lynx. The latter is found in Scandinavia, Russia, and Siberia. The lynx is a longer animal than the cat, and is distinguished by the long pencils of black hairs at the tips of the ears. It is also found in Asia and Canada. In the Zoological Gardens of London there are always several members of the cat family to be seen, as the lion, whose home is in Asia or Africa, the tiger from Asia, the leopard from Africa, and the Asiatic species known as the panther, also the jaguar, the big cat of the New World, which comes from South America.

LION.

From early childhood nursery picture books and toys familiarise the forms of the lion and tiger. The lion, as our national emblem, the "British lion," is almost as well known as the cat. Every child knows that he has a sandy-coloured body and a long tail with a black tuft at the end of it, and a great wide head with a long flowing mane. The lioness has no mane, and the cubs, which may sometimes be seen at the Zoological Gardens, are spotted. Although he is fierce, the lion has a fine, bold, fearless expression, but hunters tell us that the so-called king of beasts will, at times, skulk and behave like a coward. There is nothing mean or low about the expression of the lion, as we usually see him in

captivity, and you feel that if you could but get to understand one another, you would be good friends. Those who have had to deal with lions and other wild animals in confinement will tell you that the lion is more tamable than any of the other big cats. If you can catch him looking towards a strong light you will see that the pupil of his eye does not contract in a long slit, as the cat's does, but that in closing it keeps its circular form as your pupil does. Unlike the rest of the cat tribe, the lion cannot climb. Hidden within that tuft of hair at the end of his tail is a horny claw, the use of which is doubtful, but it is possible that with this weapon he may lash himself to fury, as we have been told he does sometimes. From Bible and other stories we know that lions must have lived in Palestine and Greece, but they are not found there in the present day.

TIGER.

Asia is the home of tigers. They inhabit every country of this continent, penetrating as far north as Siberia. The fur is thicker than that of the lion. The ground colour of the coat varies from brownish-yellow to reddish-brown, and this is marked with vertical stripes of black. The haunts of the tiger are the swampy jungles. Here the ground colour resembles that of the decaying leaves, and the stripes resemble the shadows of the broken reeds and branches. With stealthy cat-like tread and body almost invisible the tiger is upon its prey

before danger is realised. He is beautiful in form, perhaps more beautiful than the lion, but his countenance has not that noble defiance so characteristic of the lion. It is easier to see our friend the cat in the tiger than it is in the lion.

LEOPARD.

The leopard is a smaller animal than the tiger, whose skin is yellow with round black spots. Lying on a branch of a tree, the spots on the leopard's back so exactly resemble the shadows of the leaves on which the sunlight is playing that even the experienced hunter is deceived. The leopard or panther, like the lion, inhabits Asia and Africa. Some writers restrict the name panther to the African species, while Sir Samuel Baker calls all large leopards panthers. They are expert climbers like the cat, but have round pupils to their eyes. Black leopards are not uncommon, and specimens of this variety have been in captivity in the Zoological Gardens.

The snow-leopard or ounce is a beautiful animal, which lives in the highlands of Tibet. Specimens, though rare, were recently on view in the Zoological Gardens.

The jaguar and puma are the big cats of the New World. The former is tan-coloured, marked with black rings; the latter is unmarked and is greyish-brown. The jaguar or American tiger feeds on turtles, surprising them on the sand, and even pur-

suing them into the water. With great skill the soft parts of the body are extracted from their position between the upper and under shells.

The jaguar is gradually being exterminated from the more inhabited parts of America, but its range is from Louisiana and Northern Mexico to the north of Patagonia.

The puma is the American lion. It has a wider range than the jaguar, being able to endure the extreme cold of North America and the extreme heat of the tropical forests of South America.

The cat has many other relatives, which there is no space to mention here. It is, however, impossible to omit some reference to her more distant relatives, the mongooses, for is not the history of Rickiticki dear to us all? The Egyptians valued and revered the mongoose for her power and courage in fighting with deadly snakes, and for this reason the bodies of mongooses were often embalmed. The animal has been called the "Cat of Pharaoh," and sometimes "Pharaoh's Mouse"! There are several varieties of mongooses found in Africa and some parts of Asia. In Africa it is called the meerkat, and in Egypt the ichneumon. It is always a tractable and easily tamed little animal, becoming very devoted to its owner.

CHAPTER II

DOGS

WE shall now have to leave the cats and turn to the great friend and comforter of man—the dog and his allies. Numberless stories have been told and books written recording the intelligence and devoted affection of dogs. “Faithful as a dog” has become a proverb, though exactly why the dog should have acquired this admiration and affection for man is difficult to explain, when all his relatives are absolutely untamable. Mr. Maurice Maeterlinck’s impersonation of the dog character in Tylo in his play of “The Blue Bird” is most appealingly true and pathetic, and Mr. Rudyard Kipling’s lines in “Actions and Reactions” could only have been written by one who had experienced the devotion of a dog friend. ‘Rab and His Friends,’ too, will always be a story dear to dog lovers. These are but one or two masterpieces among many delineations of dog character.

The origin of domestic dogs, of which there are about 180 varieties, is much more obscure than that of the domestic cat. The dingo or wild dog of Australia, though quite wild now, is thought to have been formerly tame and brought to Australia by the

native races. There are also wild dogs in India, but the generally received opinion is that the various breeds of domestic dogs have descended from the wolf and the jackal, man having gradually evolved them by taming various species, and through thousands of years selecting those to breed from which he found most tractable and useful to him.



FIG. 9.—Dog's Skull. (Photo. by H. C. Wood, from a specimen in the British Museum of Natural History.)

The dog may be easily distinguished from the cat by having a longer muzzle and more teeth, which are not so sharp as the cat's. He has the same number of toes and fingers placed in the same position, but the claws are not hooked and he has no power of withdrawing them. The skin of the pads is thicker and harder and the tongue is smooth. The limbs are harder and more bony, and the body

generally is not so supple. The senses of sight and hearing are highly developed in the dog, but the sense of smell is much more keen than in the cat, and it is by scent that he hunts. Wild dogs, wolves, and jackals hunt in packs, but foxes hunt singly. Tamed



FIG. 10.—Cocker Spaniel. "Flap." (Photo. from life by H. C. Wood.)

dogs were kept as pets and used for hunting by the Babylonians 4000 B.C., and they were also used by the ancient Egyptians.

Recognising that the dog possesses what Sir Ray Lankester has called educability, man has made use of this faculty to learn, and breeds dogs to serve him

in various ways, while some kinds merely gratify his fancy.

Of the useful dogs we have the various kinds with good "noses," which are trained for hunting and other sports, such as the pointer, the fox-hound, the deer-hound, the fox terrier, and the retrievers;



FIG. 11.—"Jack," an old Wire-haired Terrier.
(Photo. from life.)

dogs trained for services of various kinds, as the turn-spit, which dogs were, in fact, formerly used to turn the great spit which roasted the meat, by treading on a wheel much in the same way as the donkey turns the water-wheel at Carisbrooke Castle in the Isle of Wight; the bloodhound, which will follow the scent of man; the St. Bernard dogs, by

whom so many travellers have been rescued from the snow in the Alps; the clever, faithful sheep-dog and many others. A dog's keen "nose" has also been used to trace the haunts of a particular kind of edible fungi called "truffles," which grow beneath the surface of the ground. Dogs were formerly harnessed to carts



FIG. 12.—Dachshund. "Tweaker." (Photo. from life.)

and used for draught in England, but the law does not permit that now. In Holland and Belgium and other countries they are still so used to draw milk-carts, and frequently the strange sight may be seen of a man or woman riding in a cart drawn by a dog.

Of fancy dogs there is an almost endless number, some bred for size, others, like the tiny lap-dog, in which diminutiveness is the charm; some with long

hair, some with short, some with long ears and others with short; while the soft, fat, lazy pug should have a curled tail, and the clever poodle who will play all kinds of tricks has usually that appendage shaved, with a tuft left at the end to imitate the lion.



FIG. 13.—Chow. "Brutus." (Photo. by F. W. Bond.)

This faculty of educability, or capacity to learn, so rare in cats, is possessed by dogs and horses to an eminent degree, and their willingness, even desire, to place their faculties at the service of their human friend and to work untiringly for him has made them his constant companions.

The wild dogs of Australia (dingos) and the

pariahs of India unwittingly serve the useful office of scavengers by eating up the refuse thrown out from the villages.

Through association with man for thousands of years dogs have lost much of their wildness, but amongst the few characteristics handed down from their ancestors is that of the method of making their beds. However luxurious the basket or cushion supplied to them, dogs will turn round and round on it, rooting into it with their noses, just as their forefathers made their beds by scratching out a burrow in the earth. Some dogs have acquired a taste for a mixed diet, but by those who keep them it should always be remembered that the dog is a carnivorous animal, and flesh, and especially bones, which his teeth are admirably adapted to crush, are his natural food. It is impossible to him, as to a young baby, to digest starch. He will occasionally take grass of his own accord, as a medicine, and for this reason green vegetable may now and then be given to him.

The dog does not, like man and the horse, sweat through the skin of the body, but through the mouth. It is therefore cruel to keep a dog without water, or to put upon him any kind of harness which prevents him from opening his mouth when overheated. He is subject to a terrible disease, known as hydrophobia, which produces serious consequences, often death, in men and women when bitten by a dog mad with this disorder. By a strict and wise supervision of dogs in England and on the Continent the disease has been almost stamped out. Pasteur, the great French bacteriologist, amongst the many benefits he

has conferred on mankind by his life-long investigations into the causes of many deadly disorders, has taught us much about the nature of hydrophobia, which enables the physicians to treat the malady with greater chance of success.

WOLVES.

Wolves, which closely resemble dogs but are larger, were once wild in Britain. They still live in Germany, Austria and Russia, and a few survive in France. Edgar in the tenth century diligently strove to free England from these dangerous beasts, 'by levying fines of so many wolves' heads instead of gold or silver and by forgiving certain crimes on the payment of a number of wolves' tongues. William of Malmesbury, in his 'Chronicle of the Kings of England,' says that Edgar commanded Judwall, King of the Welsh, to pay him a yearly tribute of 300 wolves. This he did for three years but omitted in the fourth, declaring there were no more. But the wolf was not finally exterminated from England until the reign of Henry VII, between 1485 and 1509. During the twelfth century wolves abounded in the New Forest, and wolf hunting, which was considered a royal sport, took place in the month of January, which, in consequence, was called Wolf Monat or Wolf Month.

We find in Hazlitt's 'Tenures of Land' a quotation from Harl. MS. Brit. Mus. No. 34, p. 166, as follows :

"Alan, son and heir of Walter de Wulfhunte, made fine with the King by two shillings and four-

pence for his relief for one messuage and one oxgang of land, with the appurtenances in Mansfield Woodhouse in the county of Nottingham, which the aforesaid Walter held of the King in capite by the service of hunting wolves out of the forest of Sherwood, if he should find any of them." 1347.

Also in the 'Antiquities of Nottinghamshire,' by Robert Thoroton, we find, p. 273 :

"Sir Robert Plumpton Knight died about 11 (Hen) VI (1432-33) seized of one Bovat in Mansfeld Woodhouse called Wolfhunt Land and one Essart in the same town at Wadgate near Woodhouse Mill held by the service of winding an horn and driving or frightening the wolves in the forest of Shirewood."

Finally, the ancient fear of the wolf remains with us in the folk story of 'Little Red Riding Hood.' But recently Mr. Rudyard Kipling and Mr. Jack London in their stories of wolves have shown us a different side of wolf life and character.

Long after wolves were exterminated from England they continued to live in Scotland and Ireland. From Scotland they were exterminated about 1680 but they lingered in Ireland till 1710.

THE FOX.

The craft and cunning of Reynard or Tod the fox is told in many a song and story. But for the sport of hunting him he would long since have gone the way of the wild cat and wolf.

In England and Ireland fox-hunting is a national sport celebrated in some of our most characteristic

folk songs. In spite of Reynard's depredations in the hen-roost and his slaughter of young partridges, pheasants, and grouse, so forcible is the unwritten law of custom that there are but few persons, if any, in England or Ireland, even if they never hunted themselves, who would not look upon shooting or trapping a fox as an unpardonable crime. In Scotland the case is different; the nature of a greater part of the country being unsuitable to the sport of fox hunting, Master Reynard is regarded as vermin in deer forests, and trapped or hunted with terriers. The fox being an unprotected animal in Scotland, and having to struggle for his own existence, is consequently a bigger and stronger fellow than the fox of the south.

An understanding between the fox hunters and the game preservers protects the fox from the game-keeper, a good price being paid for a fox if he is delivered over to the hunt alive. To appease the owners of robbed hen-roosts a fixed price per bird is paid. But it is difficult to assess these damages correctly, and of the extortion that frequently occurs Miss Somerville writes :

"P is the price of the aged old hin

That's ate by the fox over 'n' over ag'in."

The pelage or fur of the fox is reddish-brown on the back and white underneath, the muzzle and the backs of the ears black, the tail is reddish, and ends in a brush of long black hairs, tipped here and there with white; the feet and legs to the first joints are black in front. The whiskers, which are sensitive like the cat's, are black. It is interesting also to

find that the pupil of the eye of the fox closes, though not so completely as that of the cat, in a vertical slit. The fox is a silent, stealthy night hunter, hunting singly and not in packs, as the wolf does. The sensitive whiskers enable him to feel when he cannot see, and the vertically closing pupil betokens sight so keen as to enable him to see in very dim light. In connection with the keen sight of the fox, it may be remarked that the cubs are born blind. His home, which is called an "earth," he will sometimes dig out for himself if the soil is sandy and easily worked, or he will adapt to his requirements an old rabbit burrow or the deserted "set" or home of the badger. Occasionally he has been known to occupy the same "set" with this much maligned animal. In the day time he is fond of lying under the cover of gorse bushes. He is very untidy and dirty in his home, littering it with all kinds of refuse. He is also very foul smelling, though to some it would appear that the scent is not disagreeable, since Linnæus speaks of it as an "ambrosial odour." In this "earth" are born, usually in March or April, but sometimes earlier, from three to seven cubs. They are carefully tended by the vixen, the dog-fox helping her to hunt for them when they are able to eat solid food.

The hunting operations are usually carried on at some distance from the earth, nests of young partridges and pheasants quite near it being left unmolested. This is probably an endeavour to conceal the whereabouts of the cubs. The vixen often moves her family, taking them from the earth and sheltering

them in a pile of faggots, or another "earth." They remain with her until about September, but are not full-grown until they are eighteen or twenty months old. The food of foxes consists of mice, rats, rabbits, hares, pheasants, partridges, poultry, and young birds, also fruits and berries, and we all know about the fox's fondness for grapes.

He is a wholesale slaughterer, killing when he gets the chance far more than he can possibly eat. Mr. Millais records an instance of the rapacity of a vixen who, at Leonardslee, in the month of May, jumped a 7 ft. wire fence and then scaled a 9 ft. fence within that, which was supposed to protect some captive pheasants. In a single night the robber slew fifty-one full-grown birds, and next morning the cubs were found sitting outside awaiting the delights of their mother's game-bag. But in spite of these troublesome ways the fox does good service in ridding us of vast numbers of rats and mice and keeping down the number of rabbits.

Such as the fox is now, so it has existed in England for thousands of years. Its bones are found fossil in the Red Crag of Pliocene times, and again, its remains are preserved abundantly in the brick earths of the Thames Valley, and more recently in the peat formations, and thus it is connected with historic times.

The fox is very widely distributed both in Europe and Asia. The silver fox, so much valued for its beautiful pelage, is found in North America. The Arctic fox, specimens of which may be seen at the Zoo, is bluish in colour in summer and white in

winter. This variety, according to Sir Leopold McClintock, makes a winter store of food. "A fox was observed," he says, "to carry off eggs in his mouth from an eider duck's nest, one at a time, until the whole were removed, and in winter to scratch a hole down through very deep snow to a cache of eggs beneath."

CHAPTER III

BEARS

BEAR, BADGER, OTTER, STOAT, WEASEL, POLECAT, AND
FERRET.

Dogs and cats walk on their toes, but bears and their kindred walk on the palms of their hands and the soles of their feet, which are smooth and not hairy, except in the case of the polar bear, who needs the hairs to keep him from slipping when walking on ice. They have five toes, and are unable to withdraw their claws as the cats can. Unlike the cats they are never spotted. Bears are now seldom seen in the streets as they used to be thirty years ago, being led on a chain to gain their own and their tamer's livelihood by their tricks. You must go and look at Bruin in the Zoological Gardens. He may have come from the Alps, Norway, Russia, the Pyrenees, or India, or, if he be a grizzly, from North America. You will see him eat buns, sweets, nuts, and fruit. In fact he is not strictly carnivorous. You will compare his heavy, awkward, almost tailless body with the grace of such big cats as the lion and tiger. Nevertheless Bruin is a handsome fellow, and in his own way can do many things as well as

any cat. About 1000 years ago he was an inhabitant of the highlands of this country and Scotland, but there seems to be no evidence that bears ever lived in Ireland.

Many are the stories told of Bruin, and in most of them we find him represented as having a rough kindness for man. We all love old Baloo who taught the jungle law to Mowgli and the wolf cubs.

Bear-baiting was one of the most popular pastimes in England during the sixteenth and seventeenth centuries, every king and many of the richer nobles maintaining a bear-pit. Under the Commonwealth the sport was less popular, but was revived again at the Restoration. It is not clear whether these bears were all imported into England from Italy, but the first recorded exhibition of bear-baiting took place at Ashby-de-la-Zouch in the reign of King John, where "thyss straynge passtyme was introduced by some Italians for his highness' amusement, wherewith he and his court was highly delighted."

Strutt, in his 'Sports and Pastimes of the People of England,' the first edition of which was published in 1801, says: "Bull- and bear-baiting is not encouraged by persons of rank and opulence in the present day, and when practised, which rarely happens, it is attended only by the lowest and most despicable part of the people, which plainly indicates a general refinement of manners and prevalency of humanity among the moderns; on the contrary, this barbarous pastime was highly relished by the nobility in former ages and countenanced by

persons of the most exalted rank, without exception even of the fair sex. Erasmus, who visited England in the reign of Henry VIII, says there were 'many herds of bears maintained in this country for the purpose of baiting.' When Queen Mary visited her sister, the Princess Elizabeth, during her confinement at Hatfield House, the next morning, after mass, a grand exhibition of bear baiting was made for their amusement, with which it is said their highnesses were right well content."

There were several "bear gardens" or places where the populace could resort to witness the baiting of bears, bulls, and other animals. The best known of these was Paris Garden on Bankside in Southwark. Hentzner, in his 'Travels in England' (1598), speaking of the baiting of bulls and bears, says: "They are fastened behind and then worried by great English bull-dogs, but not without great risque to the dogs from the horns of the one and the teeth of the other, and it sometimes happens they are killed on the spot; fresh ones are immediately supplied in the places of those that are wounded or tired. To this entertainment there often follows that of whipping a blinded bear, which is performed by five or six men, standing circularly with whips, which they exercise upon him without mercy, as he cannot escape from them because of his chain; he defends himself with all his force and skill, throwing down all who come within his reach and are not active enough to get out of it; on which occasions he frequently tears the whips out of their hands and breaks them."

In 1582 an accident occurred at Paris Garden; the scaffolding, crowded with spectators, suddenly fell, and more than one hundred persons were killed or severely wounded. As this accident happened on a Sunday it was considered by many to be a heaven-sent curse on this form of entertainment, but nevertheless, the Bear Gardens continued to be popular, and we find that Evelyn visited the Bankside Garden on June 16th, 1670, of which visit he writes in his diary: "I went with some friends to the Bear Garden, where was cock fighting, dog fighting, beare and bull baiting, it being a famous day for all these butcherly sports, or rather barbarous cruelties. The bulls did exceeding well, but the Irish wolfe-dog exceeded, which was a tall grey hounde, a stately creature indeede, who beate a cruelle mastiff. One of the bulls toss'd a dog full into a lady's lap as she sat in one of the boxes at a considerable height from the arena. Two poore dogs were killed, and so all ended with the ape on horseback, and I most heartily weary of the rude and dirty pastime."

Shakespeare lived for a time on Bankside, not far from Paris Garden, and near the Garden were the theatres, the "Rose," the "Hope," the "Swan," and the "Globe." So popular was bear-baiting in Shakespeare's time that the bears were known by name in the same way as the public now become familiar with the names of famous racehorses.

In 'Merry Wives of Windsor,' Act 1, Scene 1, Slender, speaking to Mistress Anne Page, says :

Why do your dogs bark so? Be there bears i' the town?

Anne: I think there are, sir; I heard them talked of.

Slender: I love the sport well; but I shall as soon quarrel at it, as any man in England: You are afraid, if you see the bear loose, are you not?

Anne: Ay, indeed, sir.

Slender: That's meat and drink to me now. I have seen Sackerson loose twenty times, and have taken him by the chain but, I warrant you, the women have so cried and shriek'd at it, that it passed; but women, indeed, cannot abide 'em; they are very ill-favoured rough things.

In Knight's illustrated edition of 'Shakespeare' there is an illustration of "Sackerson loose," which the note says was composed by Mr. Bass upon the authority of a description in Strutt's 'Sports and Pastimes.' The same note says that Sackerson was a celebrated bear exhibited in Paris Garden in Southwark.

The polar bears who now have a magnificent English residence in the Zoological Gardens come from the Arctic regions, and probably could have told us all about the North Pole had we been able to understand their language, and could thus have saved Commander Peary and many others a deal of trouble. They are more strictly flesh-eaters than the brown bears, but will occasionally eat fruit. Buns, however, are wasted on them. At home their chief food is seals' flesh.

BADGER.

The most bear-like fellow countryman we have is the badger; but very few of those people who use the expressions, "cross as a badger," "stinks like a badger," have ever seen the animal alive, or know

whether he does really possess the qualities referred to. Whereas a lady describes her pet badger as "fat, round, jolly and good tempered," while others personally acquainted with him have thoroughly white-washed him with regard to the offensive smell which was supposed to be connected with him. We must admit this sturdy, playful, harmless fellow has been much maligned for the want of being better known. His habits, however, do not tend to extend his human acquaintance, for he lounges and sleeps in his stronghold by day, going out at night only, and very silently, to hunt. He must have been much better known formerly than he is now, for his ancient name "brock" enters into the names of many towns, as Brockenhurst, Brockleby, Brocklehurst, Broxbourne, Brock-le-bank, Brockley, Brockham Green, and many another.

The badger's coat is earthy-grey on the back and sides. The under parts of the body, neck, and legs are black, and therefore darker than the back, which is a very unusual arrangement of colour in animals, but as the badger only goes out at night he casts no shadow. Animals that move by day avoid casting shadows by being white or light in colour beneath. The head and neck of the badger is white, with a broad band of black on each side, running from the top of the nose through the eyes and ears to the nape of the neck, leaving the tips of the ears white. The tail is grey tipped with white. Brock is a podgy, bear-like animal, with a short tail and short legs. Like the bear he runs on the soles of his feet, which are naked. He has long nails on the



FIG. 14.—The Common Badger (*Meles meles*).

forefeet, and these assist him greatly in digging out his "set," which is the name given to a badger's earth. Indeed, so rapidly can he dig in some soils that Mr. Millais* gives an account of an unsuccessful attempt to draw badgers, in which eight able-bodied men were digging for ten days, always hearing the badgers digging beneath them, and finally they had to leave the animals masters of the situation.

The head and body together measure about 27 or 28 inches and the tail $7\frac{1}{2}$ inches. The height at the shoulder is about 11 inches and the average weight of a male badger about 25 lbs. The female is a little smaller. Few people have seen a living badger at home in the woods, for this is not an easy feat to accomplish. Mr. Millais† has described his vigil of the badger with the eloquence of a poet and the true instincts of a sportsman. He says: "To see the badger at home we must take up our position before sunset and await the coming night. The fork of a tree is a good site, as most animals, badgers included, never look upwards, and you can see all things without being seen. In meditative silence you look and listen, as the sounds of daily life gradually die and the voices of the evening float through the surrounding landscape. When you have climbed to your perch the cuckoo is still uttering his monotonous call, the wood pigeon cooing or the turtle dove purring to his mate. The farm boy sings in his raucous voice as he is driving

* 'Mammals of Great Britain and Ireland,' vol. ii, 63.

† Millais, *loc. cit.*, vol. ii, 49.

the cows home from pasture and all nature is preparing itself for rest. Bang goes a distant gun and you see a wave of scurrying rabbits making for the cover. The sound is perhaps followed by a sharp squeal of pain or the cry of the man to his dog, and then all is silence for a while. The sun sinks below the horizon and the swallows and swifts alone pursue their prey, as the first pipistrelle flitters past your tree. Soon the swallows are gone to roost and you listen and wonder where the swifts are gone to, as their screaming voices sound fainter and fainter away up in the clouds. They have gone too, and the first notes of the nightingale and the long-eared owl tell you that night is coming on. An hour has gone since you first climbed the tree: you have become stiff and cold and the midges annoy you; but happily the evening breeze sweeps them all away, and soothed by the gentle rustle in the surrounding foliage you cease to think of your discomfort. You can still see in the hazy landscape the long line of feeding rabbits, for their fears are once more set at rest. When looking towards the 'set' you notice the clean, white head with the two black lines that you have come to see. Another head looks out, and yet another, and then with a short run the old badgers are out and sitting down to listen. They are soon followed by the youngsters, who start a game of romps, as their elders gradually wander away to forage amongst the nettles and the foxgloves. Perhaps the harvest moon has risen to show you all you want to see, or you may have to be content with a flimsy grey streak or two, almost in-

distinguishable from the spots of light discernible in the twilight. You may be lucky and watch for an hour the gambols of the little badgers, and learn things about their natural history the pleasures of which are unknown to the 'desk naturalist.' At any rate you will have spent a pleasant evening, never without interest, where the voice of nature and her wild creatures have played their part."

Sir Alfred Pease, in speaking of the characteristics of the badger, says: "No animal prefers a more quiet life, loving a warm bed in a dry, dark corner of the earth or rocks. He loves to sleep and meditate in peace for the greater part of the twenty-four hours. He lies not far within his entrance hall during the spring and summer, and on a hot day he will sometimes come to the mouth of his hole. In the evening in June or July he will come outside, sit looking into the wood or shuffle round the bushes, stretch himself against the tree stems, or have a clumsy romp with his wife and little ones; and when the daylight dies he will hurry off, rushing through the covert for his nightly ramble. In the summer he will travel as far as six miles from home, but he is in bed again an hour before sunrise."

The badger's "set" is generally found in dense copses and in soft, easy workable soil, though sometimes he will work out cavernous passages in rocks. The set consists of tortuous passages opening out into roomy chambers. Here several families of badgers may reside amicably together, the males always dwelling apart from their wives in a separate chamber when they are nursing their young ones and thus avoiding

the noise and bustle and turmoil of family cares. It is often stated that there is only one entrance to the set, but Mr. Millais speaks of a set with forty-four entrances. In making a new set badgers usually appropriate a rabbit-hole, enlarging and adapting it to their needs and taste. Occasionally foxes and badgers will inhabit the same earth. No doubt cunning Reynard will make use of "Brock's" superior capacity for digging, and good-natured "Brock" suffers in consequence, for the badger is a very cleanly housekeeper, frequently changing the litter which forms his bedding in the sleeping chamber, leaving no refuse food about the entrance to his set, and carefully burying his excrement like a cat. The fox is a dirty, untidy housekeeper, and thus landlord and tenant fall out, and Brock, losing his temper, slays his tenant's cubs, and in this way has got himself a bad name among fox hunters; also he is a great fidget and must always be on the move when he is awake, scraping and digging and prying into other people's business; consequently he cannot resist opening up fox earths that have been stopped. For these two sins the fox hunter pursues poor Brock unmercifully, who has to pay the penalty with his life. The badger walks, as we have said, like a bear, leaving an unmistakable spoor, and feeds like a bear on fruits, nuts, roots, birds' eggs, frogs, snakes, slugs, snails and insects. He will also rob the bees' nests of honey, and is especially fond of wasp grubs and indifferent to the stings of the worker wasps. Doubtless badgers will take pheasants' eggs when they come across them, and they will eat young rabbits,

but on the whole the badger is a harmless animal, and really useful to the farmer, not to speak of the great interest attached to him by reason of his ancient lineage and his quaint form and habits.

On the authority of Sir Richard Owen, Brock is the oldest known species of mammal now living on the face of the earth. This fact makes him of supreme interest, and we can find no reason to destroy him, but every reason to protect him. Very little trouble is needed to guard against any slight depredations he may commit. The young are born blind in the month of March, and there are generally three or four in a litter. The badger is a very good mother, attending very carefully both to the toilet and education of her children, keeping them strictly within sight of the set until they are old enough and strong enough to defend themselves. Mr. Millais says that he has watched the mother badger "take each cub in turn and thoroughly overhaul its coat for parasites. Grooming each in turn with champing jaws she turned them over and over with her nose till every part of her offspring had been successfully explored, and thus relieved them of the annoying pests which at that age they seem unable to destroy." All mammals except seals and whales are subject to parasites of some kind. The parasite peculiar to the badger is a kind of flea (*Trichodictes*), which Miss Lort found behind the ears of her pet badger "Sally," and much relieved the irritation and discomfort by the application of vinegar and water.

Mr. T. Denning White,* speaking of the discipline

* 'Badminton Magazine,' July, 1903.

maintained by a mother badger in her family, says: "I have seen her turn back and shake severely a cub that would insist on following its dam away from home, the poor little chap hobbling a retreat, very injured at heart, stopping to perch on its haunches and gaze wistfully in the direction its mother had gone."

You have only to look at a badger's skull to realise the force of his grip. The lower jaw of all the other mammals is attached to the upper by cartilage, and, when the soft parts are taken away the lower jaw is separate from the skull, but you cannot separate the lower jaw of the badger without breaking the bones, because the surface of the skull at the hinge (glenoid surface) grows round and grips that part of the lower jaw (condyle) which meets it. With these jaws a badger can hang on to the death and grip with such force that his teeth invariably meet. Thus, though a small animal, he is a formidable antagonist when at bay.

Badgers are hunted and trapped in various ways, sometimes by digging them out, sometimes by placing a sack at the entrance of the den with a noose at the mouth when the occupant of the den is known to be abroad. He is then hunted back to the set with terriers, and as he rushes into the sack the noose is drawn. Or the badger hunter goes out with terriers and armed with badger tongs with which to grasp the badger and put him into the sack when the dogs have pinned him. These tongs have wooden handles and iron heads. Brock is too clever to be easily caught in traps. Many instances are known of his

having turned a somersault over the offending thing and thus sprung the trap.

Badger baiting, a most cruel and cowardly amusement, common in the eighteenth century, is now happily illegal.

Many country people believe the badger to be invulnerable except to a blow on the nose, because of the difficulty both of trapping and shooting him. His skin being so very thick and his hair so stiff, the shot does not penetrate. Another curious belief about the badger is that he is lop-sided, his legs on one side being longer than those on the other. This was supposed to enable him the more easily to run along a hillside. In the seventeenth and eighteenth centuries it was a common practice in the south of England with the churchwardens to pay, from the church rate, for the destruction of vermin. In churchwardens' accounts of the parish of Warehorne, near Ashford, in Kent, from 1705–40 the following payments frequently occur: "1s. each for martens, foxes, greys (badgers), polecats, 2d. each for hedge-hogs."

STOAT (OR ERMINE), AND WEASEL.

Closely allied to the badger, though much smaller in size, are the stoat and weasel and their less well-known connections, the marten and polecat, of which last the ferret is but a domesticated variety.

The male stoat is $10\frac{3}{4}$ inches long taking head and body together, and the tail is $6\frac{1}{2}$ inches long; the female is much smaller. Though the stoat's legs

are short and he runs very close to the ground, his body is long and light—very different in form from the heavy, lumpy body of the badger. His coat is reddish-brown above, with the under parts of the body, chin and limbs yellowish-white. The tail is reddish-brown with a black tip. In cold climates and high altitudes the stoat turns white in winter with the exception of the tip of the tail, which



FIG. 15.—The Common Stoat (*Putorius ermineus* [Linn]).
(Photo., H. C. Wood. From a specimen in the British Museum of Natural History.)

remains black. He is then known as the ermine and his fur is much prized, but the change of colour is not always coincident with winter, stoats having been killed with a varying amount of white in the autumn even in the south of England.

The stoat, weasel, polecat and marten are all cruel animals, slaying wholesale many more victims than they need for food, and they kill in the same way, by biting at the back of the brain case just behind

the ear. Their food consists of birds, birds' eggs, rabbits, hares, mice, etc.; thus they are one and all pursued with all the skill of which the gamekeeper is capable. Though the marten and polecat would seem to be dwindling in numbers owing to this persecution, stoats and weasels are still not uncommon.

The stoat, or "hob," as he is known in the country, makes his home in stony places or thickets, and there the young stoats are born in spring, the litter usually numbering five to eight. Mr. Millais speaks of a stoat's nest made of fine grass having been found in a hole in a tree trunk fourteen feet above ground, and of others having been found in stumps of trees, rabbit-holes, and even in a nesting-box in a tree. The stoat is an exceedingly graceful animal, moving by leaps and bounds, and so swift that it will escape a dog in a short run. It hunts by scent usually, but often catches its prey by strategy, rolling over and over and performing all kinds of antics calculated to deceive the young and unwary animal. Mr. Millais tells how he was sitting drawing deer in Warnham Park "when I heard an unusual commotion amongst the blackbirds and thrushes in the small cover at my back. Out in the open park, about thirty yards from the cover, were some twenty or thirty young thrushes hopping about and waiting for their parents to bring them food. Presently a stoat looked out of the bushes opposite the young birds, some forty yards from me, and at once commenced a series of somersaults. After each performance it would advance a foot or two towards the stupid youngsters, who seemed lost in wonder at its curious

antics. It had got within ten yards of its unconscious victims when two old thrushes came flying from the wood shrieking with all their might, first above the stoat and then over the threatened offspring. The young birds at last took the hint and flew one after another into the wood, whither the disappointed diner promptly followed them."

Stoats and their relatives often make a store of their surplus victims. Such larders have been found in a hole in a tree stump stored with carcasses of rabbits, rats, mice, birds and birds' eggs. In order to preserve the egg intact the stoat moves it by rolling it along, holding it steady with his chin and pushing with his feet.

A correspondent of Mr. Millais records having seen a stoat move a hen's egg and roll it down a bank in this way. Mr. de Winton, writing in Lydekker's 'British Mammals,' says, "I took forty-two pheasant's eggs from one hole in May, 1894, and have got the skin of the old 'Hob' who amassed this larder."

Like the lemmings of Scandinavia and many other animals, stoats will occasionally migrate in packs, and are then said to be dangerous, and to attack a man who crosses their path.

The weasel is a much smaller animal than the stoat, and, though resembling it in general form, the weasel has a much shorter tail, which lacks the black tip. The fur is a tawny brown above, not so red as the stoat, and the under parts are pure white, the white extending to the upper lips.

The head and body together measure about 8

inches and the tail $2\frac{1}{2}$ inches. This little animal is common in England and Scotland but unknown in Ireland. It is a most useful friend to the farmer, since it slays rats, mice, voles and moles in countless numbers, pursuing them underground, but the farmer must guard his birds and hen-roosts from its on-



FIG. 16.—The Weasel (*Putorius nivalis*). (Photo. from life by H. C. Wood.)

slaughts, and it is quite worth his while to do this and let the weasel vent his ferocity on the moles and voles, for the reports of the Committee appointed by the Board of Agriculture to inquire into the plague of field voles in Scotland, in 1892, give a number of statements by witnesses, all tending to prove the weasel to be *par excellence* the destroyer of field mice.

Like the stoat, the weasel fascinates its victims

by rolling and tumbling and performing other unusual antics before them. The late Mr. E. T. Booth* recorded in the 'Field' an incident which he witnessed while driving between Shoreham and Lancing. Four wheatears, a whitethroat and a robin were enthralled by a weasel which was running backwards and forwards across the road followed closely by a whitethroat, which fluttered with quivering wings from six inches to a foot above the weasel's head. The robin sat in the hedge and looked on while the wheatears stood motionless in the road, simply turning their heads to watch the motions of the weasel, who merely ran backwards and forwards across the road.

The food of the weasel consists of small birds, mice, voles and young rats and rabbits, and small birds' eggs. Cats and dogs will kill weasels, but the little animal will often turn on them.

Mr. Douglas English has made some very interesting photographic studies of weasels taken from the members of a litter of five weasel kittens found in a haystack. They were, he says, very attractive and easily handled pets.

Weasels hunt in packs at night, and are the "fairy hounds" or "dandy dogs" of the folk tales which hunt the hares in the moonlight. In the west of England a weasel is called a "vairy" and its skin is considered lucky. Dr. Primrose in the 'Vicar of Wakefield' says, "My wife was usually fond of a weasel skin purse as being most lucky, but this by the bye."

* 'Field,' October 6th, 1883.

Thus in the song:

“Up and down the City road,
In and out the ‘Eagle,’
That’s the way the money goes,
Pop goes the *weasel*.”*

The “Eagle,” afterwards the Grecian Theatre, was a place of resort for evening entertainment, the chief source of attraction being comic singers, and in this way the lucky purse or weasel was soon gone.

It is more probable that the popular song was suggested by a north country boys’ and girls’ game song, which is given in ‘Wright’s Dialect Dictionary.’ The game consists in players forming two opposite rows of boys and girls, which go backwards and forwards singing a verse, and when they reach the last line twirl round. One of the verses is:

“Half a pound of nuts and spice,
Half a pound of treacle,
Stir it round and make it nice,
Pop goes the *weasel*.”

Here the last line apparently has no reference to pawning, but expresses the twirling and winding of the couples.

The writer of an article entitled “Countrymen’s Nature Lore,” in ‘The Times,’ December 3rd, 1910, says: “the name of ‘cane,’ often applied to the weasel, is restricted to an imaginary species supposed to be smaller than the true weasel, as the rene thrush is smaller than the song thrush.”

* Mr. R. E. Adlard writes: “The explanation given by my father to his inquiring youngster many years ago was that “pop” meant to pawn, and a “weasel” was a flat iron—the last household article to be parted with for necessities or extravagances.

To the countryman in south-east Surrey the name "weasel" is unknown. They call the animal a "kine" or "coin"—I can never be sure of the spelling, because I have never succeeded in inducing any of my friends to write the word, but Bell, in his 'British Quadrupeds,' (2nd ed., p. 187), gives the word "kine," and derives it from the French word *chien*. Since writing the above I have heard the weasel called a "keen" in east Kent, and I believe the name represents his powers as a keen, quick, sharp fellow at killing vermin. "We have no rats in our stacks," said the farmer, "there is always a keen about."

MARTEN.

Mustela martes (Linn).

The marten is now a rare animal in England, though formerly common. As the country became deforested the marten has been driven further and further north, and is now practically confined to north Lancashire, Westmoreland and Cumberland. It is still found, but not in large numbers, in Scotland, Wales, and Ireland. It is a bigger animal than the stoat, the head and body together being 18 inches long, and the tail, which has a bushy tip, is 13 inches in length. The coat is thick and glossy, and on the back is deep reddish-brown with a yellowish-grey under-fur. The throat and chest and insides of the ears are yellow and the rest of the under-surface grey.

Until 1879 two species of martens were thought to inhabit England—the pine marten and the beech marten, but naturalists have now decided that there is only one British marten—*Mustela martes* (Linn),

the pine marten. It lives amongst the wildest recesses of the hillsides and rocks, and is so shy a creature that it is rarely seen in its native haunts. In the denser forests of Germany and Austria it is said to live in the trees and to hunt squirrels, bounding and leaping from tree to tree with great agility and grace.

In north-eastern Asia and Canada it is replaced by the more silky coated sable, an animal so highly prized and so much hunted for its fur.

POLECAT.

The polecat is about the same size as the marten, but may be distinguished from it by its colour, which is a deep chocolate brown; by its shorter tail of 7 inches against the marten's tail of 13 inches; and by the colour of the under parts, which are blackish-brown. The lips are white, and a yellowish-white band extends across the forehead and down the cheeks; the ears also are fringed with white, and the under fur is yellow.

Since the polecat is the most dreaded enemy of all game preservers it has been hunted down mercilessly, and is now more or less a rare animal. Formerly both the marten and the founart, as the polecat was called, were hunted with wire-haired terriers in Westmoreland and Cumberland. The meaning of the name "polecat" has puzzled etymologists. Some derive "pole" from Gaelic "poll" or Cornish "pol" meaning a pool or burrow, from its home in a hole or burrow; others say "pole" is the French "poule," a hen, and thus derive the name from the propensity

the polecat has for slaying fowls; while others again say that "pole" is a variation of the Anglo-Saxon "ful" (foul). Thus the animal is a foul cat, which corresponds with its name founmart. These names, as also fitchet and fitchet weasel, refer to the animal's disagreeable smell. Fitchet is derived



FIG. 17.—The Polecat (*Putorius putorius* [Linn]). Photo. by H. C. Wood, from a specimen in the British Museum of Natural History.)

from a low German and Scandinavian word meaning "to make a disagreeable smell."

Another explanation of the name occurs to us: may not the term "polecat" be derived from the habit these animals have of attacking the heads of their victims? It is a habit common to all the Mustelid family (stoats, weasels, etc.) but is peculiarly noticeable in the polecat, who will pith or paralyse numbers of frogs and toads by biting through the brain and leave them uneaten.

FERRETS.

Ferrets, as has been stated above, are a domesticated form of polecat. Under domestication the colour of the coat has varied and the animals are feebler and less alert, but an occasional cross with a wild polecat improves the intelligence and the stamina



FIG. 18.—The Ferret. (Photo. from life by H. C. Wood.)

of the breed. Ferrets are employed to kill both rabbits and rats, and were so used, according to Prof. Mahaffy, by Strabo B.C. 30 to A.D. 25. The south west of Europe as far as Marseilles and Corsica and the Balearic Isles were infested with a plague of rabbits, which ate the trees and crops. Strabo advised the domestication of the "African Weasel" which was muzzled and sent into the holes, bringing

out the rabbit with its nails, or making it bolt from the hole for the men to catch.

In order to keep ferrets in health and fit for their work they should be fed on meat and their cages kept scrupulously clean. They will eat bread and milk, but bread is not their natural food. They need plenty of water, both polecats and ferrets being excellent swimmers and expert fishermen. The ferret cage should have a sleeping place and a good run, the floor of which should be made of wire with a movable tray beneath. The tray should be taken out daily and thoroughly cleaned and covered with fresh sand.

OTTER.

The otter, being especially adapted for an aquatic life, differs considerably in outward form from the badger. Though its construction is on the same plan as that of the badger, it is very seal-like both in appearance and habits. Like the badger the hinges of the jaw interlock; it has somewhat similar teeth, and the usual gland of the Mustelid family at the root of the tail, which secretes an evil-smelling fluid.

The long outer hairs are deep brown on the back and sides and greyer underneath. The under fur, which is very woolly and thick, is yellowish-white at the base and grey at the ends.

The legs are short, indeed so short that in running through the snow the footmarks are entirely swept out by the fur under the body.

They are about 2 feet to 2 feet 6 inches long from the nose to the root of the tail, which is 16 inches to 20 inches long.

The head is short, broad, and flattened horizontally. The body is long and slender, and the tail is flattened, being twice as broad as it is thick and ending in a



FIG. 19.—The Otter (*Lutra lutra*). (Photo. from life by W. S. Berridge.)

blunt point. Thus the entire animal forms a kind of wedge offering the least possible resistance to the water. The toes are webbed, and the feet are naked. The nostrils are mere slits, which can be closed when the animal is in the water, and the ears, too, are small and round, and can be closed with a fold of skin.

Otters are widely distributed both in the Old and

in the New World. In the British Isles they inhabit the banks of nearly every river, but by their agility in the water and their shy, silent habits they escape the sight of man, who is practically their only enemy, and their presence is more often made known by the havoc they commit amongst the fish in our streams. Like the other members of their family they are fond of slaughter and will despoil far more fish than they can eat. Even in eating them the otter is wasteful; beginning at the back of the neck of the fish—"the otter's bite"—he eats only the best part of the flesh around the shoulders, leaving the head and the tail, and never eating the entrails or roe.

Mr. Millais says*: "It is very seldom that the naturalist, however painstaking, has much chance of observing this interesting animal in its quieter moods. The nature of the beast is so shy and retiring that opportunities of seeing the more interesting side of its character are few and far between. The view that the otter hunter gets, though certainly interesting, is one in which the animal exhibits its wit, swimming power and rapid movements, but not necessarily the broader phases of its daily life. One learns little of the stag by chasing it with hounds, but a great deal by sitting on a stone with a telescope at any season.

"Disappointment, however, only awaits the man who sits on stones and waits for the otter to appear. It never comes out and disports itself when expected, and only the evening fisherman, moving quietly up the river, sees the round head of our seal-like friend,

* *Loc. cit.*, vol. ii, p. 5.

moving across the stream, or a chain of bubbles which marks its path beneath the surface. If he is very lucky he may see an otter bring a fish ashore, or to some rock in midstream, and there devour a hasty meal. Or, perhaps, a female otter may bring her reluctant babes to the water and give them a swimming lesson, and delight him with their merry gambols. Such sights are, however, rare, and the most we learn of the otter is by inference, and the study of places and things that it has temporarily vacated."

If this is the experience of such a skilled, untiringly patient and sympathetic naturalist as Mr. Millais, we who are but feeble disciples cannot wonder if we fail to catch sight of an otter, and I trust therefore that I may be excused for quoting so largely from the very graphic writings of such an accurate observer of Nature.

It is possible to attract the inhabitants of the otter ponds at the Zoological Gardens with suitable food, but those who throw buns to the polar bears and biscuits to the otters can hardly expect to have many of Nature's secrets revealed to them. A piece of fish, a few shrimps or a snail may induce them to show themselves to you.

Many otters have been, and are still, tamed and kept as pets, becoming very docile and much attached to their masters, suffering to be lifted by their tails, but snapping fiercely if stroked on the nose or head. It is a common practice to train otters to catch fish in China and North India, and there are a few instances of their having been so trained in this country.

The home of the otter is called a "holt" or a "hover." It is generally an excavation in the bank of a stream, which is approached by a long tunnel, having its opening below the surface of the water, thus enabling the otter not only to enter his home unseen, but to slip into the water and swim away if his holt is attacked. There is a ventilating hole opening in the bank and several chambers opening out of the tunnel. In an otter's holt which was uncovered by Harvie Brown and described in his 'Fauna of Argyll and the Inner Hebrides,' the tunnel was 15 feet long, and a chamber near the entrance seemed to serve as the kitchen midden, being full of empty mollusc shells, pieces of lobster shells and fragments of fish. In rocky country the holt may be under a large boulder or in a cairn of stones. The stumps of hollow willows often afford safe retreats. Otters travel many miles from water, probably in search of food when the fish supply runs short. They have even been known to attack poultry runs and young lambs. They also go down to the sea and frequent the estuaries of rivers to catch the salmon as they run up the rivers from the sea.

"Emerging," says Mr. Millais, "about sundown from its retreat in the bank or reed bed, the otter slips noiselessly into the water for the evening hunt. If you are ever so near you will not hear the slightest sound, as the movement of entering the water is so easy and 'oily' that the animal may almost be said to pour itself into the stream. Otters often hunt alone, but sometimes two join together in attacking salmon, although a full-grown otter is individually

quite capable of killing a large fish. Swimming up stream rapidly, the otter lands frequently, especially where the rush of water impedes its progress, and, trotting or galloping briskly, cuts off corners or passes up the rocks at the sides of waterfalls till it reaches some favourite fishing ground where food is plentiful. In this manner otters range over considerable distances during their evening and nocturnal peregrinations and their tracks of five rounded toes (called the otter's 'spur') with the web mark often showing in the mud or sandy beach are unmistakable for those of any other creature."*

Although the otter is generally described as a deadly enemy to fish preserves, to be diligently sought for and exterminated if possible, Mr. Millais, who is an ardent fisherman, thinks that even in the big salmon rivers otters do no harm to fish, "and he is a churlish fisherman indeed who grudges this graceful creature his share—a share, too, that rightly belongs to him—of the mass of fish. On nine rivers out of ten, otters live on fish which are not considered by the angler, and on the tenth the quadruped probably does quite as much good as harm by thinning down the old male trout, which destroy endless numbers of spawn and fry." He also kills salmon infected with disease and thus helps to purify the river. "After all," the same sportsman says, "if otters do kill a certain number of clean fish, man has no right to a complete monopoly. The Almighty never intended that such selfishness should exist on our part or He would not have created so many

* *Loc. cit.*, vol. ii, p. 9.

beautiful things to delight our eyes. A policy of 'live and let live' is without doubt the correct one, though the man of narrow views is ever with us."

This seems to be the attitude of the true naturalist and sportsman, and the policy, one, we should do well to adopt towards all our fellow creatures. It means that we must learn to know the ways and habits of living things, and that the true naturalist will always pause to consider the relation of any living thing to the economy of Nature before taking its life.

Otters hunt by scent and can smell a fish or an eel under water. They can keep under water without coming up to breathe a very long time, but I can nowhere find the record of any observations as to the length of time they can go without taking breath. They hunt fish under the ice, but will seek cracks in its surface at which to come for breath.

The young are born with soft silky coats and blind. There are usually two or three in the litter, and though the mother early accustoms them to water, swimming about with a cub in her mouth entirely immersed in the water, they all have to be taught by their parents to swim. At first they take a ride on their mother's back, and then they are reluctantly induced to try to copy their mother's movements in the water; after that comes the diving lesson, and then, as the young ones gain skill and courage, the first hunt for eels, a very favourite food with otters, is undertaken.

Otter hunting is a very ancient sport, and, if the animal is hunted with a pack of hounds, no unfair advantage is taken of it, for the otter is a fierce and

powerful animal for its size, extremely agile and swift in the water and almost equally swift on land. Thus an otter hunt usually means a fine run through beautiful river valleys, ending in the escape of the animal pursued. Mr. Millais says that on an average four out of six otters escape. For people who can run and do not mind wet feet it is a most enjoyable sport, which takes one out in the early morning into charming surroundings. The hounds must be put on to the "foil" or scent of the otter before the sun gets up, as afterwards it soon disappears.

The kings of England from the time of John have had their otter hounds. Edward II's pack was in the care of his famous huntsman Twici, and Henry VIII had a pack of otter hounds in charge of his huntsman Thomas Hordon. Formerly the otter was speared by a barbed spear called "otter grains," as depicted in Landseer's picture of "The Otter Hunt," but this instrument is no longer used. Otters are not now hunted in England for their fur. The best skins come from Scandinavia and from Canada, and the animals are caught in large numbers for this trade.

Fines and charges were formerly made of a certain number of otter skins.

CHAPTER IV

FLESH-EATING MAMMALS OF THE SEA

SEALS.

IN these fin-footed mammals the limbs are strangely changed to serve the needs of their surroundings. The flippers have five digits, of which the first and the fifth are the longest. The group includes the walrus, the seals, and sea-lions. Of these only two seals, the grey seal and the common seal, are now inhabitants of British seas. The walrus, morse, or sea-horse must formerly have visited our shores as his bones are found in the peat of the Cambridge-shire fens, but he is now only found in polar seas. He is a huge beast 10 feet to 15 feet long with large tusks. His food consists of molluscs ; of these, oysters, we learn from his interview with "the Carpenter," in 'Alice in Wonderland,' are peculiarly agreeable to him.

Like the sea-lion's, his hind flippers point towards the head while the seal's hind flippers are turned in the reverse direction.

The grey seal lives on the shores of Scotland, Ireland, Scilly, and the rocky coast of Cornwall.

Seals have no external ears and their nostrils are on the top of the snout. The grey seal measures about 8 feet in length, is much larger than the common seal, which is but 4 or 5 feet long.

When adult, the former is, as its name denotes, grey in colour and sometimes spotted. When first born the hair is white but it rapidly changes in colour, assuming darker tints as the animal grows. The common seal associates in large herds, often ascending rivers to chase the salmon that are returning from the sea.

These little seals possess the faculty of educability in a remarkable degree, and will follow their masters as far as their limited powers of locomotion on land will permit, making great efforts to overcome their incapacity. They are also peculiarly fascinated by music. A resident in the Hebrides told Macgillivray the naturalist that "In walking along the shore in districts where these seals were abundant in the calm of a summer afternoon a few notes of my flute would bring half a score of them within thirty or forty yards of me, and there they would swim about like so many black dogs, evidently delighted with the sounds. For half an hour, or indeed for any length of time I chose, I could fix them to the spot, and when I moved along the water's edge they would follow me with eagerness, like the dolphins, which, it is said, attended Arion, as if anxious to prolong the enjoyment. I have frequently witnessed the same effect when out on a boat excursion. The sound of the flute, or of a common fife blown by one of the boatmen, was no sooner heard than half a dozen



FIG. 20.—Common Seal in the Zoological Gardens, London. (Photo. by F. W. Bond.)

would start up within a few yards, wheeling round us as long as the music played, and disappearing one after another when it ceased." The seal is the subject of many folk tales on the coasts both of Scotland and Ireland. The Irish on the west coast tell how the fairies come out after dusk to make music for the seals to dance to. Mermen and mermaids are of course men and women who have been changed into seals.

Feeding as they do on fish, seals are considered by fishermen to be most destructive of the food fishes of our coasts, and consequently they are ruthlessly killed at the annual seal hunts.

Sea-lions are not natives of our coasts, but are of interest to us because the so-called "fur seal" of commerce belongs to this group. They are very intelligent creatures, differing from the true seals in having external ears and hind feet directed forwards. The seal pond at the Zoological Gardens affords an excellent opportunity for watching both the seals and sea-lions at play in the water and for comparing the outward forms of these two animals.

WHALES, DOLPHINS AND PORPOISES.

"The first duty of a whale is to be big" said the late Sir William Flower. Indeed the vastness of these animals, even when pictures of them and figures representing their measurements are placed before us, is difficult to realise.

The contrast of the mouse and the elephant as two examples of the mammalian organisation is striking,

but consider for a moment the lesser shrew, which measures $3\frac{1}{2}$ in., and the blue whale (*Balænoptera sibbaldi*), which reaches a length of 80–85 ft. and weighs from 220,000 to 330,000 lb.—that is, as much as a whole herd of 150 oxen. The blue whale is not only the giant among whales, but is the largest animal that exists, or ever did exist, as far as we know. Animals of such gigantic proportions could only live in the sea. The earth could not feed them. The sea alone has food enough. As Spenser so truly says in the 'Faerie Queene,' Bk. iv, Canto xii:

'Oh what an endless task have I in hand
To count the sea's abundant progeny,
Whose fruitful seed far passeth those on land
And also those which wonne in the azure sky!
For much more eath to tell the stars on high,
Albe they endless seem in estimation,
Than to recount the sea's posterity—
So fertile be the floods in generation,
So huge their numbers, and so numberless their nation."

In the sea only could bodies of such vast size and weight move about. And here the whale is as quick and agile as the proverbial fairy. Nevertheless, let us remember that whales are not fishes, but warm-blooded mammals, suckling their young and breathing air, and at the same time the most admirably adapted of all mammals to an aquatic life. On land they are powerless. The fore limbs are merely paddles, and no hind limbs are visible on the exterior. Small bones imbedded in the flesh, in the region of the loins, are the only remaining traces of these lost limbs. A stranded whale is unable to breathe, because its own ponderous weight crushes its chest.

The nostrils or blow-holes are placed on the highest part of the head ; therefore, when the animal breathes, which is only necessary to him at longer intervals than in the case of land animals, his body is not exposed above the surface of the water. He expels through the blow-holes the exhausted air from his nostrils, and in so doing produces great jets of steam, because the exhausted air, which is hot and charged with water vapour, condenses in the cold atmosphere, as our breath does in winter.

Sometimes the animal will begin blowing out before the nostrils are above the surface of the water, in which case water will be blown up with the jets of steam. But the idea that whales blow out water taken in at the mouth is quite erroneous, though many think it to be the case.

Milton says :

“ And at his gills draws in, and at his trunk spouts out a sea.”

We will try to consider the special features in the construction of this animal which equip him so admirably for the element in which he lives. To begin with his body is shaped like a boat ; there is no neck, and his tail, which is his principle organ of locomotion, is shaped like the screw of a steamer. A hairy covering is characteristic of mammals, but whales are hairless, except in the case of some species which have a few scattered bristles round the mouth. The skin is remarkably thin, smooth and shiny, like well-oiled leather. Beneath the skin is a thick coating of fat eight to sixteen inches thick, known as the “ blubber,” which serves to retain the heat of the body.

The bones are spongy in texture and filled with oil.

Whales, dolphins and porpoises abound in every sea, and some dolphins inhabit the large rivers of South America and Southern Asia. They vary considerably in size, from 4 ft. to 85 ft. in length. Cetaceans, as we have said, are flesh-eaters, but only

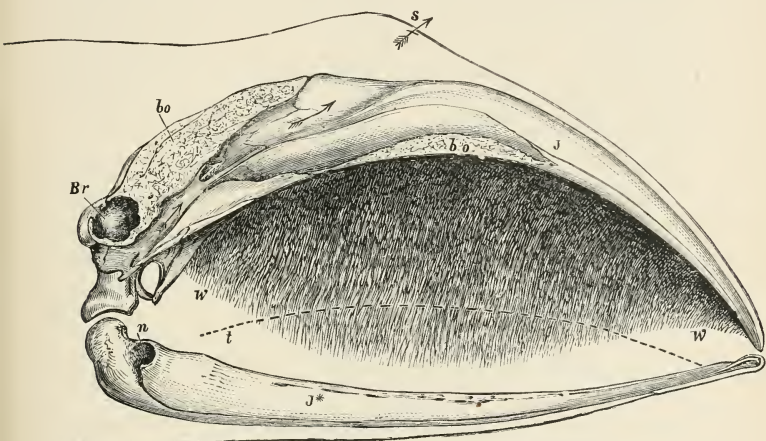


FIG. 21.—Diagram of a section of the head of Whale-bone Whale, showing position of the whale-bone. *Br*, brain case; *bo*, bone; *s*, blow-hole or nostril; *W*, whale-bone or balæn; *J*, jaws.

one group of whales, “the killers,” prey upon warm-blooded animals. Of these “Orca Gladiator,” the “grampus,” is the best known. These whales may attain a length of 30 ft. and are very rapacious, since it is stated that as many as thirteen porpoises and fourteen seals have been found in the stomach of one of them. Dr. Beddard says that the word

“grampus” is a contraction of “grand poisson,” and is thus applicable to any whale. The whalebone of commerce is not the whale’s bone. It is derived from the horny projections which hang down like stalactites from the roof of the cavernous jaws (Fig. 21) of certain kinds of whales known as the balæn or whale-bone whales, which form one of the two great groups into which the Cetacea are divided. These whales are provided with balæn or whalebone and are toothless, while those forming the second group have teeth and no balæn and are known as the “toothed whales.”

Of the whale-bone whales a few are called by the whalers “right whales,” because they are the most profitable ones to catch, since they yield the largest amount and the best kind of whalebone, also the greatest quantity of oil. The most profitable of these is the Greenland whale, found only in polar seas. It has been so largely hunted that it has become almost extinct. The black right whales inhabit the temperate seas of the northern and southern hemispheres. The blades of whalebone exhibited in the British Museum of Natural History were taken from a large Greenland right whale killed June 21st, 1887. It yielded 26 tons of oil and 26 cwt. of whalebone. In 1897 the value of whalebone was £2000 per ton. The number and size of the plates of whalebone vary. As many as 370 have been found in a whale’s jaw, and some have been known to attain a length of 13 ft. They are triangular in shape and finely fringed on the inner side.

When feeding the balæn whales swim slowly with

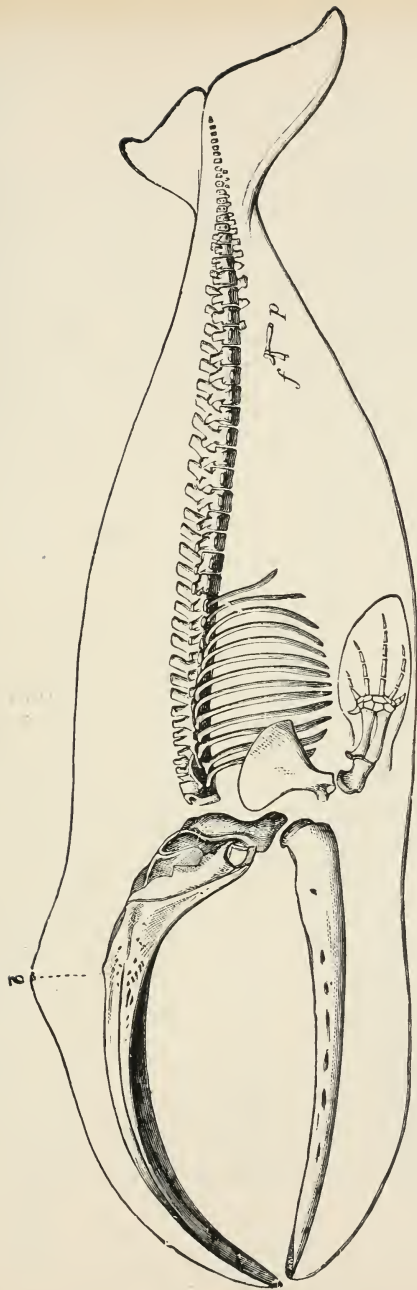


FIG. 22.—The Greenland Right-Whale (*Balæna mysticetus*). Skeleton and outline. *b*, Position of nostrils or blow-holes; *p*, pelvic- or hip-bone; *f*, vestigial femur or thigh-bone. $\frac{1}{100}$ natural size. (British Museum.)

their mouths open, and having entrapped a sufficient quantity of minute crustaceans and pteropods, amounting to several barrels full, they close the jaws. The soft tongue is pressed against the plates of whalebone, which act like sieves, retaining the solid matter and letting the water flow out. The aperture of the throat of all these whales is very small.

The fin whales, or rorquals, are also whalebone whales, but they are not so profitable when caught and are therefore not right whales. They are distinguished by a small fin on the back and by a smaller head, but the mouth and chest have long parallel furrows. Consequently when the mouth opens the gape expands like a purse.

The giant blue whale (*Balænoptera sibbaldi*) referred to above belongs to this family of fin whales.

The toothed whales, which form the second large group of the Cetacea, are more numerous than the whalebone whales and show great diversity of form and size. All the smaller kinds belong to this group. The only toothed whale which approaches the whalebone whales in size is the cachalot or sperm whale, which attains a length of 50–60 ft. The head of this whale is enormous, being one third the length of the body. It is also characterised by a strange want of symmetry. The blow-hole is single and is situated on the left side of the head. The two nasal passages fuse before they reach the surface, and the left is more highly developed than the right. On the surface of the skull rises a transverse crest of bone, which with the two lateral crests rising from the jaw-bones forms a triangular-shaped basin, wherein lies

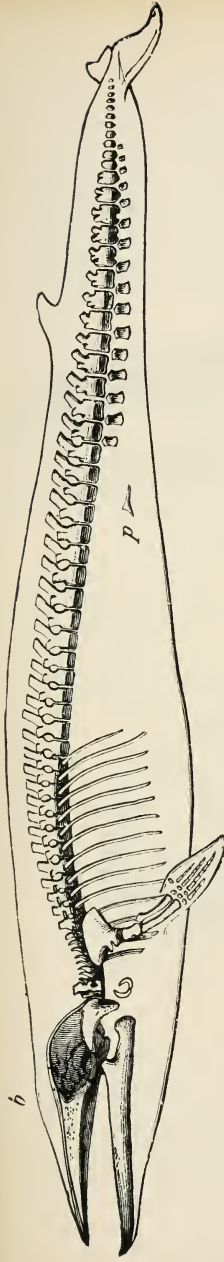


FIG. 23.—The Common Rorqual or Fin-whale (*Balænoptera musculus*). Skeleton and outline. *b*, Position of blow-holes; *p*, pelvic bone. $\frac{1}{120}$ natural size. (British Museum.)

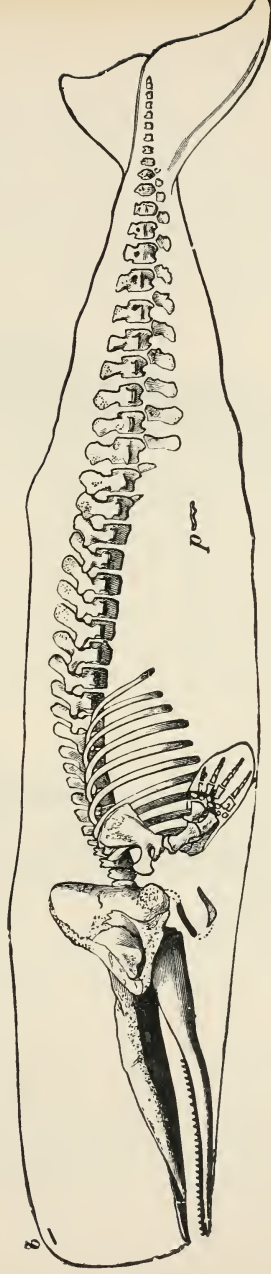


FIG. 24.—The Sperm Whale or Cachalot (*Physeter macrocephalus*). Skeleton and outline. *b*, Nostril or blow-hole; *p*, rudimentary pelvic bone. $\frac{1}{100}$ natural size. (British Museum.)

the spermaceti. This substance is an oil at the temperature of the animal's body, but solidifies when the temperature is lowered. Spermaceti has been known as a drug and mentioned in pharmacopœias

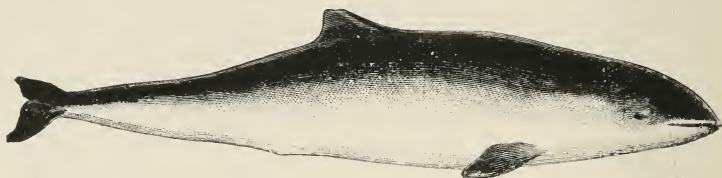


FIG. 25.—The Porpoise (*Phocaena communis*). About $\frac{1}{18}$ natural size. (British Museum.)

since the year 1100, though never accurately described until Hunter stated its true source and nature about 100 years ago.

Ambergris is another valuable substance for which

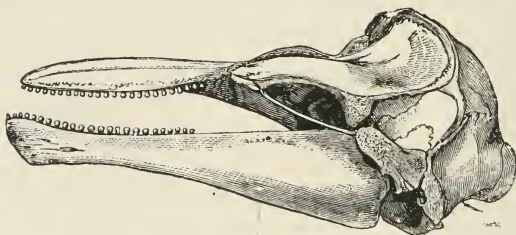


FIG. 26.—Skull of Porpoise. About $\frac{1}{5}$ natural size. (British Museum.)

the sperm whale is hunted. It has a very distinct and sweet scent and is used in perfumery, though it is a very costly article, being about £4 10s. an ounce. Ambergris is a concretion formed in the intestine of the sperm whale, and when first extracted from the

animal it is of a greasy, soapy texture, but it gradually hardens on exposure to the air. Sometimes it is found floating on the surface of the sea and often in large masses. The beaks of squids and

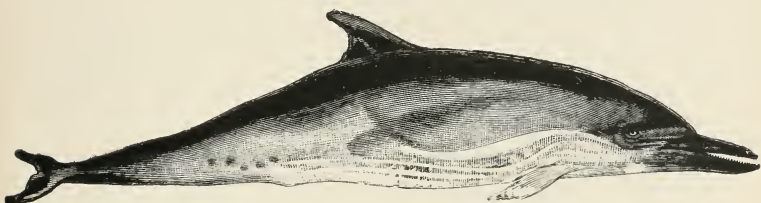


FIG. 27.—The Dolphin (*Delphinus delphis*). About $\frac{1}{15}$ natural size. (British Museum.)

cuttlefishes which are found imbedded in it indicate its origin, since these denizens of the sea form the principal food of this whale. Mr. F. T. Bullen, in

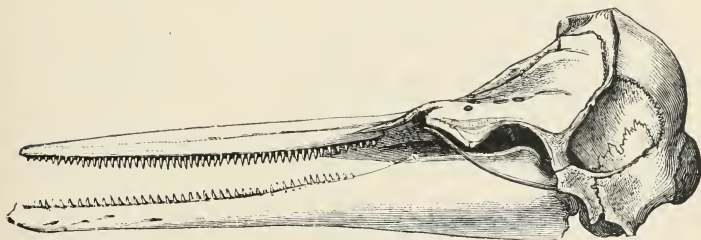


FIG. 28.—Skull of the Dolphin. About $\frac{1}{5}$ natural size. (British Museum.)

his 'Cruise of the Cachalot,' tells thrilling stories of encounters with this whale.

Unlike the whalebone whales, which have very small throats, this whale has a throat large enough to swallow a man. That being so, the cachalot is

the only whale, we know, capable of accommodating Jonah.

Dolphins and porpoises, which often play about our coasts, are also toothed whales, but they are smaller in size and are distinguished chiefly by having teeth in both jaws. Dolphins have numerous teeth, while porpoises have twenty-six in each half of each jaw. The name "porpoise" was originally "pork-pisce" or "hogfish," and since it was regarded as a fish, it was eaten during Lent. It is said that the famous physician, Dr. Caius, of Henry VIII's reign, who extended Gonville Hall, Cambridge, and became the first master of Gonville and Caius College, invented a sauce to be eaten with the hogfish.

CHAPTER V

INSECTIVORA

SMALL MAMMALS LIVING FOR THE MOST PART ON INSECTS.

THIS group of mammals, represented in Britain by the hedgehog, the mole and the shrew, is, as Prof. Huxley has said, very difficult to define, although they have existed for countless generations practically unaltered. No British aristocrat can boast of such a pedigree as the hedgehog. The Insectivora are flesh eaters, but they must of necessity prey upon very small animals, being themselves small and having but poor weapons of attack. Their food is not entirely restricted to insects as the name of the order would imply. Their teeth are of a very ancient pattern. There is no very distinct difference between incisors, canine and molar teeth, and they have not the sharp cutting incisors of the rodents. Their coverings vary from the velvet jacket of the mole to the hard spines of the hedgehog, and their forms are remarkably specialised in accordance with their modes of life.

THE HEDGEHOG.

There are hedgehogs differing very little from our little spiny friend living in Europe, Asia, and Africa. The British hedgehog has tawny yellow and grey hair underneath the body and carries on his back a very singular means of protection in the shape of a mantle of spines. When alarmed he tucks his head between his forepaws and rolls himself up into a ball. In this attitude few of his enemies care to touch him. Terriers trying to worry him will become torn and gory though the "Urchin" (an old name for the hedgehog) has not struck a blow in his own defence. The fox, the badger and the horned owl are said to prey upon them, and must have their own methods of getting at a vulnerable spot. Mr. Millais speaks of having seen a terrier kill a hedgehog by working away with his nails. He then got his paw into the centre of the ball and was able to press on the chest with one paw and draw up the head with the other, and then a nip in the throat dispatched the poor hedgehog, who has no weapon other than his spiny coat.

The hedgehog makes himself a snug little nest of leaves by digging out a hollow in a shady bank with his snout, or by appropriating a hollow beneath the roots of some old tree. Here he brings up two families in the year about June and August, consisting of five to seven young ones which are born blind and with soft spines. These, however, harden in about three weeks' time. The food of the hedgehog consists chiefly of insects, worms and slugs, but

it will also eat young chickens and game birds, snakes and vipers. It has been accused of egg stealing, but Mr. Millais defends* the urchin on this count by saying that he could not crack the egg, and his gape is not wide enough to swallow any egg larger than a sparrow's. Anyway, he is on the gamekeeper's black list as an enemy to be slain. He is said to kill snakes and vipers by giving them a sharp bite through the tail, then promptly rolling



FIG. 29.—Hedgehogs (*Erinaceus europæus*). (Photo. from life by W. S. Berridge.)

himself up. The viper, irritated by the pain of the bite, lashes itself to death by trying to strike its spiny enemy.

Old writers relate that the hedgehog will suck the udders of cows at pasture. This has never been stated authoritatively, but hedgehogs are fond of frequenting cow pastures, and will hunt round the dung for the insects that lurk there, and as Sir Harry

* *Loc. cit.*, vol. i, p. 58.

Johnston suggests, may be bold enough to lick round the udders for insects, and in doing so, come across an unexpected delicacy in the shape of a drop of milk. When kept as pets in the house for the purpose of catching beetles and cockroaches, they show a great partiality for milk.

The hedgehog appears to be so confident of the safety its spiny mantle affords that it very soon becomes friendly. Bell, in his 'British Quadrupeds,' says: "The strength and elasticity of this covering is such that we have repeatedly seen a domesticated hedgehog run towards the precipitous wall of an area, and without hesitation, without a moment's pause of preparation, throw itself off, contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourteen feet; after a few moments it would unfold itself and run off unhurt."

It is usually a silent animal, but will occasionally utter a curious little noise, something between the yap of a puppy and the squeak of a little pig.

About the last week in November the hedgehog retires to a warm nest of leaves to sleep through the winter. He makes no store of winter food as the squirrel does, and consequently there is no need for him to move about. He sleeps quietly in his winter quarters until the spring is sufficiently advanced to tempt him out.

As a pet the hedgehog is a very interesting and tractable animal. It will eat raw meat and fish and drink milk, but needs to be kept very clean and have plenty of run, otherwise it is dirty and foul smelling.

It is said to collect the leaves for its nest by rolling on the ground and impaling them on its spines, but exactly how it gets them off when needed is difficult to see. It has also been accused of transporting apples to its nest in the same way.

MOLE.

There are about eight species of moles entirely confined to the Old World. Only one of these, *Talpa europæa*, lives in Britain, though it is unknown in Ireland. It differs from the hedgehog in its habit of living underground, and its structure is modified in accordance with this habit. For instance, it has very small eyes and no external ears. It has a cylindrical body covered with very soft fur, which will turn either way. The neck is buried in the shoulders. The forefeet are broad and possess five digits, also a much elongated bone in the wrist, which has the appearance of a sixth finger. The forelegs are very short, and are set on the shoulder girdle in such a way as to enable the mole to work his forefeet outwards and backwards in pushing the soil aside to make a passage for his body. So rapidly and effectually does he do this that the mole has been said to swim through the earth. Those who are troubled with moles in their gardens will have realised this to their cost. When the soil has been nicely dug and loosened ready for planting out choice plants, then the mole delights to burrow about in it, chasing worms and thereby detaching the earth

from the roots of your plants, which consequently flag and die.

For its size the mole has immense power in the muscles of its forelegs, the bones of which are short and broad. The shoulder girdle, too, is very strong, and the collar bones afford firm surfaces for the attachment of the limbs. If possible, the skeleton of a mole should be studied, for no animal in its



FIG. 30.—The Mole (*Talpa europæa*). (Photo. from life by H. C. Wood.)

structure exhibits to a greater degree special adaptation to its mode of life. The mole needs great vitality to enable it to get through the work it does. To this end it consumes an enormous amount of food in proportion to its size, and but a brief enforced abstinence will cause death. For this reason moles are extremely difficult to keep in captivity. A full grown mole requires quite its own weight of food, if not more, per day. The diet consists of earthworms,

wire worms, larvæ of various kinds, frogs, lizards, small mammals and small birds.

Some naturalists believe that the mole makes a store of earthworms for the winter, keeping them in

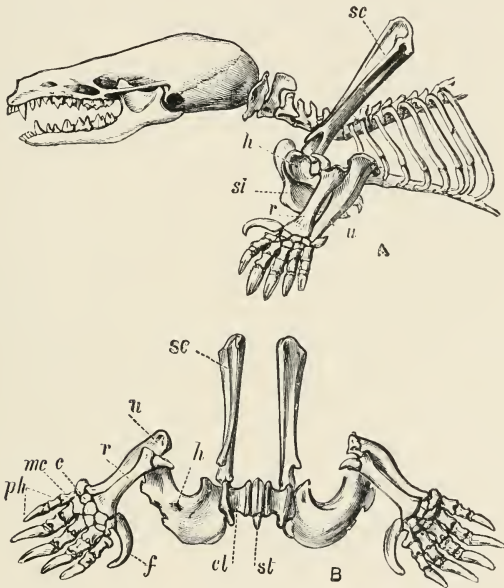


FIG. 31.—Fore part of the Skeleton of the Mole. A, Side view; B, front view of shoulder girdle. *sc*, scapula; *h*, humerus; *r*, radius; *u*, ulna; *cl*, clavicle or collar-bone; *st*, sternum; *c*, carpus; *mc*, metacarpus; *ph*, phalanges; *f*, sickle-like bone. (British Museum.)

a basin-shaped captivity in the “run.” The bottom of this cavity is beaten so hard that the worms cannot bore through it. According to Mr. Lionel

Adams,* who has made a careful study of the mole, the plan of the fortress varies considerably, according to the soil and the fancy of the particular builder, but the earthworks, which are 1 foot deep and 3 feet wide, usually consist of a cavity to hold the nest, from which the galleries lead out, and the roof consists of a mound of loose earth. In constructing this cavity a gallery is necessary in order to remove the soil, which is pushed along with the nose and finally out on the surface, forming the mole-hill. Other tunnels or galleries are made which serve as bolt runs in case of danger. The nest itself is a small round ball of moss, leaves and grass.

The mole is truly a giant among dwarfs, for he will make these earthworks in the hardest soil, where a man finds it heavy work to dig with a sharp tool, and Mr. Adams says he will turn out stones weighing over $\frac{1}{4}$ lb., which is the maximum weight of a mole.

Male moles are said to be more numerous than females, but this may only be due to the difficulty of identifying the one from the other. It is not known whether the mole, like the hedgehog, has two families in the year, but the young number from two to seven and are born naked and blind.

Moles usually frequent light soils, old pastures and recently manured, ploughed lands, but they will occasionally penetrate into clayey districts. It is said that they work during the day at certain regular hours. A writer in the 'Field' has given these times as 7 a.m., 11 a.m., and 3 p.m. During the last

* "A Contribution to our Knowledge of the Mole," 'Proc. Manch. Lit. Phil. Soc.,' vol. xlvii, pt. ii, 1903.

year we have several times noticed the movements of moles raising their mounds, and on each occasion have noted the time by a watch and found it to be a little after 11, or shortly before 3 p.m., and a gardener tells us that 7 a.m. is invariably the time at which traps are sprung.

Mr. Runciman has described the mole's method of eating a worm :

"Now the worm, as everybody knows, is filled from snout to tail with earth. One can reasonably conceive that the earth to the mole is unpalatable and indigestible. And so it is more than likely that though he crams worms into his mouth, he does so with the set purpose of getting rid of the earth within the worms.

"Whether the action shows intelligence or instinct, it is of peculiar interest and certainly more pleasant to contemplate than the cramming theory. Having caught his worm this is how the mole proceeds: First he seizes it by the tail, off which he bites a small piece, then he turns the worm round. This is accomplished with his paws, the sides of which, while their palms extend towards the front, grip the worm firmly. Then the mole, having turned the worm, draws it into his mouth with a series of short, quick jerks, at the same time moving his paws slightly forward; and the effect of this movement is to cause the earth to squirt out at the tail end, the tip having been cut off purposely to give the earth free vent. Thus the mole secures a clean meal without any distasteful clay. Evidently he knows that the tail is the proper part of the worm to bite off, and that he

must begin feeding at the nose to effect his purpose ; for it is clear," says Mr. Runciman, "from the conformation of the worm, that only in this way could the trick be done."

Moles do not hibernate like the hedgehog. They generally live at a deeper level during winter to avoid the frost. But sometimes in clayey soils which become very stiff and unworkable the mole will make a long run quite visible on the surface, possibly for the purpose of getting water, or for changing the position of his fortress. Occasionally, but very rarely, a mole may be seen hunting on the surface for worms. They are very fond of water, and all observers of moles pronounce them to be adept swimmers. One can realise the force of their forepaws in water.

Moles are said to fall victims to the owl, buzzard, stoat, weasel, badger and fox, but as a superstition says that a mole has but one drop of blood, it would seem that the stoat and weasel get little for their pains. There are many folk stories and superstitions about the mole. The hand of a mole is carried in the pocket as a sure cure for cramp. In the north of England the mole is called the "mouldiewarp" or earth-turner, while in the west it is called the "want," and in the midlands, "hoont" or "woont."

Opinion differs as to the usefulness of the mole. There can be no question that in the fields and pastures he is a very valuable assistant to the observant and diligent farmer, who works with his friend. He certainly eats another friend of the farmer, namely, the earth-worm, but he also devours his enemies in the shape of wire-worms, leather jackets, cockchafer

and other injurious larvæ. In addition to this, his burrows and tunnels make very good surface drainage, and the soft, fine earth he throws up in mounds forms excellent dressing for pastures, as ant-hills do, if well scattered in March. This the diligent farmer will do, while the lazy one will curse the moles for breaking his reaping machines and have but a poor, untidy looking pasture into the bargain.

But in a garden very little can be said for the mole. Those of us who are gardeners can only wish he would keep to his own sphere—the open fields, though exactly why a gamekeeper should destroy moles is not clear, except on the principle prevailing among some unintelligent gamekeepers, of destroying every kind of living thing which is not either a pheasant or a partridge.

The pelage of the mole is extremely soft and velvety, and the hair, moving as it does in both directions, enables him to run backwards and forwards in his burrow with equal ease. The colour is usually a steely grey, but it is subject to great variation, and we have seen specimens from the fens in Cambridgeshire which have varied from almost pure white to a rusty orange colour.

Common as the mole is, there is still much to be learnt about this animal. For instance, we are uncertain about its power of sight, some even thinking that though it has eyes, yet it is blind. Certainly the eyes are very small, but, as Mr. Millais says, it proceeds boldly in the desired direction after the manner of an animal fully gifted with sight. We know that the mole has a long, pink, fleshy nose,

curiously sensitive, and that there is an extra joint in it, but why is a blow on the nose fatal both to a mole and a badger?

SHREWS.

These useful and inoffensive little creatures are first cousins of the mole. Like him they have long noses and fur that turns either way.

There are three kinds of British shrews, two of which are fairly common, while the third, the water shrew, may be equally common, but is more difficult to see. Nine people out of ten mistake these little creatures for mice, and, indeed, they are often called shrew mice, but they are not rodents at all. If they are examined, their resemblance to their cousin the mole is at once seen. The long, sharp, pink nose and velvety fur distinguish them from mice, and if the tiny mouth be opened, the characteristic gnawing teeth of the mouse are found to be absent, and instead you see eight tiny incisors with red tips in the upper jaw and six in the lower. Beyond these there are six teeth on each side in the upper jaw and four in the lower. The tail is flat or four-sided, and not cylindrical, especially in the water shrew, and the ears, which are smaller than those of the mouse, are capable of being folded over when the animal goes underground or under the water.

Shrews must formerly have been much better known than they are now, for though innocent of all harm, no animal has been more maligned and persecuted by superstition, and not in our own country

alone. Mr. Millais relates that Mr. F. J. Jackson, the well-known hunter and Sub-Commissioner in British East Africa, recently told him, "that one day when out hunting in Uganda, he passed, on a native footpath, the dead body of a shrew. He just observed it and passed on, but his gun bearer, a raw native, immediately called his attention to the diminutive beast, thinking he had not seen it, and remarked, 'Do you know, master, that when that animal crosses the human spoor it dies?'"

On the other hand, our ancestors believed that the very touch of the tiny shrew's foot brought all kinds of evil upon the thing so touched. There was but one escape from the doom which overshadowed the "shrew-struck," whether man or animal, and that lay in the healing virtues of the branches of the shrew-ash. Gilbert White* describes the shrew-ash which stood in his village. "At the south corner of the plestor, or area near the church, there stood, about twenty years ago, a very old, grotesque, hollow pollard ash, which for ages had been looked on with no small veneration as a shrew-ash. Now a shrew-ash is an ash whose twigs or branches, when gently applied to the limbs of cattle, will immediately relieve the pains a beast suffers from the running of a shrew-mouse over the part affected; for it is supposed that a shrew-mouse is of so baneful and deleterious a nature, that wherever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is affected with cruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which

* 'Natural History of Selborne,' Letter LXX.

they were continually liable, our provident forefathers always kept a shrew-ash at hand, which, when once medicated, would retain its virtue for ever. A shrew-ash was made thus: Into the body of the tree a deep hole was bored with an auger, and a poor, devoted shrew-mouse was thrust in alive, and plugged in, no doubt, with several incantations, long since forgotten."

Gilbert White goes on to say that this tree was stubbed and burnt by the late vicar, "regardless of the remonstrances of the bystanders, who interceded in vain for its preservation, urging its power and efficacy, and alleging that it had been preserved with reverential awe for years."

A horse seized with cramp or numbness in the fields was thought to be planet-struck or shrew-struck. The treatment prescribed was to drag the horse through a piece of bramble rooted at both ends. It is a habit of bramble branches to throw out roots when they touch the ground.

Shrews eat worms, insects and larvæ, and in so doing are the friends and assistants of man, and it is hard to see on what foundation these superstitions were based, unless it be that shrews have the power of emitting a musky, disagreeable odour from the secretion of glands on their flanks. This scent, though slight in our British shrews, is nevertheless emphasised in some foreign species, rendering any food that they have been near quite uneatable. It is doubtless this secretion which makes dogs and cats, who will kill shrews, refuse to eat them. They are, however, eaten by owls and by their cousin the mole.

Like the other members of their order Insectivora these tiny creatures are voracious feeders, nor can they suffer hunger for any length of time, and live. So he who would keep any of them in captivity must devote his time diligently to feeding them, rising early and going to bed late, and feeding them continuously and in quantity, out of all proportion to their size. I have never succeeded in keeping a mole alive more than four days, being then utterly wearied in my efforts to obtain an adequate supply of worms. But time and strength would not be thrown away in an effort to keep these animals, because so little is known of their habits.

Shrews are, however, most pugnacious little creatures, fighting desperately and devouring the fallen. Therefore it is useless to attempt to keep more than a pair of shrews in one cage.

Shrews being so small of stature, and feeding only on the flesh of animals which are destructive to the crops grown by man, they are perfectly harmless creatures, but were they as large as lions and tigers, their teeth would be deadly instruments of destruction, and by their fierceness and voracity they would rapidly depopulate the whole earth. Fortunately, then, the shrews are all diminutive creatures.

The Rev. Edward Topsell says of the shrew in his 'Historie of Fourfooted Beastes,' published 1658, p. 406 :

"It is a ravening beaste feigning itself gentle and tame, but, being touched, it biteth deep and poysoneth deadly. It beareth a cruel mind, desiring to hurt anything, neither is there any creature that it loveth,

or it loveth him, because it is feared of all
They go very slowly ; they are fraudulent and take
their prey by deceit."

And on the principle of like curing like, we may suppose, the same author goes on to describe the medicines which may be prepared from the body of the shrew by burning it and grinding it to dust.



FIG. 32.—The Common Shrew (*Sorex vulgaris*). (Photo. from life by H. C. Wood.)

The subject of these superstitions is the common shrew, *Sorex vulgaris*. His velvety fur is rusty grey above and white beneath. His head and body are $2\frac{3}{4}$ inches in length and his tail $1\frac{1}{2}$ inches. He is common in England and Scotland, but is not found in Ireland. Though the males are the pugnacious members of shrew society, their name has been given to the unfavoured ladies of human society. The dead bodies of shrews are frequently to be seen lying

on the roadside in autumn, and often in such numbers that it is a matter of question how they could have come by their fate. The problem has so far not been satisfactorily solved.

Mr. Millais suggests that they migrate in August and September, not to any great distance, but in search of better feeding ground, after the manner of the lemmings in Norway.

THE LESSER SHREW.

Sorex minutus has the distinction of being the smallest British mammal. This is the shrew of Ireland. Its tail and snout are proportionately longer than those of the common shrew. The head and body measure together 2 inches and the tail $1\frac{1}{2}$ inches.

The teeth of this shrew are so small that a lens is needed to detect them.

THE WATER SHREW.

The water shrew is the largest of the British shrews, being $3\frac{1}{4}$ inches long, taking head and body together, with a tail about 2 inches in length. It is usually black above, a colour which is very rare amongst animals, and white beneath, but the colour of the coat varies a good deal, so much, indeed, that formerly there was considered to be more than one species. They make burrows in the banks of streams and rivers, and live on the larvæ of fresh-water insects, being particularly fond of caddis-fly larvæ, water snails, fish and frog spawn, and young fish

fry. Water shrews are particularly shy animals and are consequently not often seen, but the patient observer who will sit long and quietly by a river bank may see them come out of their burrows to dig for worms or hunt for water-beetles along the margin of the stream.

CHAPTER VI

GNAWING ANIMALS—RODENTS

THIS order includes a very large collection of small animals, ranging in size as to its British representatives from the tiny harvest mouse to the hare, but rodents of various sizes are found all over the world. They are mammals walking for the most part on the soles of their feet, not on their toes, and only a few are carnivorous. Pussy treading softly on her toes stalks the mouse running lightly on the soles of its dainty feet. The house mouse is a typical rodent with which everyone is familiar. With the rat we are fortunately not all so familiar, since it becomes a veritable plague, not only eating and destroying our property, but carrying the germs of disease in its coat.

The peculiar teeth of these gnawing animals will enable us to distinguish any member of the order at once. In the lower jaw there is a single pair of chisel-like incisors, and these meet a similar pair in the upper jaw, where there may also be a second pair of incisors as in the hare and rabbit, but they are always small and never present in the lower jaw. These two pairs of incisor teeth of the upper and

lower jaw form as they meet a segment of a circle. They grow continuously and are covered with hard enamel on the front surfaces only ; the other parts of the teeth being of softer material wear away more quickly by constant use in gnawing, and thus a sharp cutting edge of enamel is maintained. The colour of the enamel is white, yellow, red, brown, or even black.

Though the continuous growth of the incisors is a great convenience to the rodents, giving them a power of gnawing through substances that no other animals of their size could penetrate, still this gift may sometimes prove a curse, for, should one of the opposing teeth get broken, the one which worked upon it goes on growing considerably with nothing to wear it down, and curving round may actually penetrate the skull. Thus a rabbit or hare, to whom such an accident has befallen, may die of starvation from inability to nibble its food.

Everyone should examine a rabbit's or hare's skull to see the working of these powerful chisels, the rodent incisors. Beyond the incisors there is a considerable space in the jaw, which is devoid of teeth and over which the skin grows ; then come the cheek or grinding teeth, on which the hard enamel is raised in transverse ridges for grinding up the food. That part of the lower jaw (condyle) which forms the hinge with the upper jaw is elongated from back to front into a long ridge, which enables a rodent to work its lower jaw backwards and forwards, and munch its food with its cheek teeth in the peculiar way we have all noticed when watching

our pet rabbits. Rodents usually have collar bones, and their feet are plantigrade or nearly so. There are five toes on each foot and each toe has a claw. The upper lip is divided (hare-lip), which gives the animal free use of his incisors for gnawing. They are for the most part ground animals, though a few live in trees and some are aquatic. Rodents form the most numerous of the Mammalian orders and have the widest geographical distribution. They are found even in Australia, the home of the marsupials, but the largest and strangest forms are found in South America. Four families of the order are represented in Britain. Formerly, when the beaver was an inhabitant, there were five families represented—the squirrel, the dormouse, rats, mice, and voles, hares and rabbits.

THE SQUIRREL.

The squirrel is the only representative of his family in Britain. Squirrels of varying form are found all over the world except in Australia and Madagascar, and included in the family are the marmots and prairie dogs. Members of the squirrel family are distinguished by their teeth.

Our British squirrel is extremely common, having but few enemies other than man, and he, slayer that he is, will hesitate to kill the playful, dainty little red fellow, skipping from tree to tree.

The form of the squirrel is so familiar that it need not be described beyond drawing attention to a few interesting points, which should be noticed. There

are five toes on each foot, but on the forefoot the thumb is a mere stump.

Those who have kept tame squirrels will know that the brilliant red fur of summer becomes duller and browner in the winter and the hair longer and softer, and there are tufts of hair on the ears. The moults usually occur in May and October.

The body and head of the squirrel are together about 8 inches long, and the tail 7 or 8 inches. Anyone within reach of a wood needs not a great share of patience to catch sight of this wild creature in his native haunts. I have seen him in the less frequented parts of Hampstead Heath and Golder's Hill, skipping about from branch to branch. But those who would see him must be silent and motionless, for he is a timid creature, and with the slightest sound, which reaches his sharp ears, he has vanished.

Beautiful as the squirrel is, no one who has any knowledge of forests, especially forests of larch and Scot's pine, can deny that he is most wantonly destructive. If only there were some human in such close touch with the wild things, some really effective St. Francis, who could arrange terms of peace between us humans and the creatures of the woods, he or she would doubtless say to the squirrels: "We could agree on the basis of enough being as good as a feast; we agree that you should take your toll of food; live and let live, but believe me, waste spells want." Squirrels, however, delight in making elaborate preparations for imaginary feasts which never come off. They bite and throw down many more young shoots, cones and nuts than they can

possibly eat. Sometimes these are stored in holes and forgotten; sometimes they are scattered on the ground. I have seen in the neighbourhood of Perth the birches, Scot's pines and larches "ringed" by squirrels, *i. e.* they bite off the bark in order to suck the sweet sap from the growing layers of the wood. Undoubtedly the squirrel is an enemy to foresters and we cannot wonder at their killing them, but this is not the only persecution squirrels have to undergo. Here and there a squirrel may take to eating birds' eggs and even young birds, and consequently the gamekeeper will attribute these evil ways to his whole race and condemn them to death as vermin, but the proper food of squirrels consists of nuts and fruits of all kinds. Of beech mast they are especially fond, and it is very pretty to watch the squirrels in a beech wood collecting the nuts from the delicate outer branches of the trees by hanging on with their strong claws where it is impossible for them to walk. They will also feed on various kinds of fungi. I have myself seen them in Norway feeding on the large red fly Agaric.

The most heartless torment that can be perpetrated on a squirrel is to put him into one of those dreadful wire cages with whirring wheels. It is the very nicety of torture thus to imprison this fairy of the woods, whose whole structure is but an expression of scampering, dancing freedom. Properly treated a squirrel is a good pet, as he will attach himself to those who look after him, and will come back for his food, if allowed his freedom.

The grey squirrels in the Zoological Gardens

appear to take but little notice of the visitors, and amuse themselves by making stores in the grass of the nuts that are thrown to them.

When eating, the squirrel sits on his long hind legs and grasps the nut with his hand-like forefeet. The shell of a hazel nut is first bitten at the pointed end, and then it can be easily broken and the kernel extracted. The nest or "drey" of the squirrel is built of sticks together with moss and leaves. It is often very high up in the fork of an oak or pine tree. There are sometimes two entrance holes to the nest, one at the bottom to give an escape down the trunk and one at the side. It is one of the warmest, cosiest homes that is built by any animal, impervious to rain, and so scientifically placed and constructed as to stand fast against all gales, even in the airy position favoured by squirrels. This is the squirrel's home, not built merely to serve the purpose of a cradle as birds' nests are, though a new one is usually built by the father and mother squirrel together for the young family. Sometimes an old home may be repaired, sometimes an old crow's or magpie's nest may be adapted to their needs. In this "drey" two families are born, one in the spring and another in the late summer, about August. The litters number two to three, but Mr. Millais* says: "I have seen and heard of four several times. They are at first naked and born blind, but they grow very quickly. They are certainly very good mothers, and get fearfully excited if the young are threatened. The young closely resemble the adult, except that

* *Loc. cit.*, vol. ii, p. 156.

their tails are red and thinly haired. It is a charming sight to see the mother bringing food to the young when they first emerge from the nest. I have seen the little ones sitting in a row outside their home just like a flock of young long-tailed tits, all snug and cosy together. The mother passes the food to each with her mouth and not with her paws. She also carries them with her mouth."

Mr. Harting* says: "The old squirrels in case of danger remove the young from the nest or 'drey' to some hole in a tree, whither they carry them, one by one, in the mouth, just as a cat carries her kitten. One of the prettiest sights in the world is to see an old squirrel teaching a young one to jump."

Our squirrel becomes greyer in winter. In Russia and Siberia they become quite a pale grey, and in that state the fur is known as miniver, while it is squirrels' hairs which are used to make the so-called "camels' hair" paint brushes.

The squirrel is such a constant inhabitant of woods and forests, and is so extensively distributed, that it is frequently the subject of myths and folk tales. The Rev. Charles Swainson† says: "In Germany there is supposed to be an alliance between the squirrels, as the little people of the trees, and the fairies, who are the elves of the grass and the flowers; while in Norway the squirrel is regarded as the postman of the forest, who carries all sorts of news between the different wild animals. In Germany, too, he is a sort of Christmas patron saint, like Santa

* 'Zoologist,' 1891, p. 102.

† Harvie Brown's 'Squirrels in Great Britain.'

Claus, and brings presents to those whom he favours. From its red colour it is associated in Norse mythology with the great god Thor, and in the 'Edda' we read of the great ash-tree Ydrasil, whose branches embrace the world, on the crown of which sits an eagle; under its roots lurks the serpent Nidhogr, while between them the squirrel, ever running up and down, seeks to sow dissension."

Traditions of ancient forests are kept alive in many parts of the country by old sayings, that the squirrel could pass from tree to tree for great distances without descending :

" From Blaem Point to Hilbree
Squirrels in search of food
Might then jump straight from tree to tree,
So thick the forest stood."

These lines refer to the extent of Wirral Forest.

THE BEAVER.

We have heard of beaver hats, and beaver fur is familiar to many. Some know that the fur grows on the back of an animal that builds a wonderful home in the banks of a river, but few are very clear as to where the beaver comes from, or whether it is or is not an inhabitant of Britain. Topsell, a writer on natural history before quoted, says: "For giving great ease unto the gowt the skinnes of beavers burned with drie oynions" are excellent. Castorein, a drug prepared from the anal glands of the beaver, was, until recently, included in the Pharmacopœia.

So, for the fur and for the drug, the beaver has been incessantly pursued until it has been almost exterminated from Europe, and the fur we now know as beaver is obtained from the North American species (*Castor Canadensis*). This species differs from the



FIG. 33.—The Beaver (*Castor fiber*). (From a photo by F. W. Bond.)

European beaver which once inhabited Britain mainly in having a much shorter nose.

Castor fiber, the European beaver, is now found on the banks of the large rivers of Europe, such as the Danube and the Rhône, but it is getting more

and more scarce. It was extinct in England in pre-historic times, but its fossil remains in the very recent deposit of the fens of Cambridgeshire, and the turbaries of the Lea Valley, and in the deposits of the Norfolk Forest bed, Kent's Hole, Torquay, and the Thames Valley, tell us that it was once an inhabitant of this country, and many place-names tell the same story. Examples of these names are Beverley in Yorkshire, Beverage in Worcestershire, Bevercater in Nottinghamshire, Beverstone in Gloucestershire, and Beversbrook in Wiltshire. A small tributary of the Severn is known as Barbourne or Beaverbourne, and near to it is an island called Beaver Island, while further up is another island called Beverage or Beaverage. In Wales and Scotland there is historic evidence of the beaver. Giraldus Cambrensis, in his 'Itinerary through Wales,' says they were living in 1188 on the banks of the Tievi in Cardiganshire, and the King Howel Dda, who died in 948 A.D., fixed the price of a beaver skin at 120 pence, the skins of wolf, stag and fox being only worth eightpence each.

The Welsh name for beaver was "Llosh-llyddan," which means "broad-tail." Giraldus also remarks that beavers were found in Scotland in one river, but were very scarce. "Yet," Mr. Millais says, "we know that in the reign of David I the skins figured amongst Scotch exports of the twelfth century, although they no longer appear in accounts of export duties in the reign of James I (1424). Yet Hector Boece, writing in 1526, states with confidence that beavers existed in Loch Ness at that

date and that their fur was in request for exportation until the end of the fifteenth century." Mr. Millais questions the statement of Boece that beavers frequented Loch Ness, since all the beavers he saw in Canada, North America and Newfoundland were living on running streams or narrow lakes through which the water was flowing.

The beaver is a very large rodent, specially adapted to its aquatic mode of life. There is generally a living specimen in the Zoological Gardens, but it rarely shows itself, and everyone should make themselves acquainted with the form of this remarkable and interesting animal by means of the stuffed specimens in the Natural History Museum. The hind feet are webbed, but the fore-feet are not. The tail, as the Welsh name implies, is broad and flat and covered with scales. It serves its owner, who is an adept swimmer, as a rudder. The eyes and ears are small, as is usual with aquatic animals.

William Harrison, in his 'Elizabethan England,'* gives a very picturesque description of the beaver: "And likewise of the beaver, whose hinder feet and tail only are supposed to be fish. Certes the tail of this beast is like unto a thin whetstone, as the body unto a monstrous rat: as the beast also itself is of such force in the teeth that it will gnaw a hole through a thick plank, or shere through a double billet in a night; it loveth also the stillest rivers, and it is given to them by nature to go by flocks unto the woods at hand, where they gather sticks wherewith to build their nests, wherein their bodies lie dry above the

* Camelot Series, 'Elizabethan England,' p. 170.

water, although they so provide most commonly that their tails may hang within the same. It is also reported that their said tails are a delicate dish . . . (for to say the truth we have not many beavers, but only in the Teisie in Wales).

THE DORMOUSE.

This beautiful little animal is a well-known pet, and has been known to live in captivity three or four years, if carefully fed and if due attention be paid to give it every facility to continue, as far as possible, its natural habits. One of the most remarkable of these habits, from which it derives its name, is the long sleep in which it indulges from the close of the nut harvest till the following spring. At intervals on a mild day the dormouse wakes up and takes a little refreshment from his store of food, laid by for the purpose, therefore the little Seven Sleeper, who is a guest in your house, must have a store of food by his bedside in case he should wake at any time, and need some sustenance, and he must have a soft, cosy winter bed of grass and leaves, such as he is used to when he makes his own in an ivy-covered hazel stump. The breeding nest is usually built in a bush or tree, sometimes, though rarely, in tufts of grass, near, but not on, the ground. The nest is about 6 inches in diameter, and built loosely of grass and oak leaves. Mr. Millais has noticed that the nightingale and the dormouse have similar taste in the choice of sites for a home, the favoured spots being the edges of oak woods with undergrowth of hazels.

Neither dormice nor nightingales care to isolate themselves in the solitudes of the heart of the wood. Disused birds' nests and even nesting boxes are occasionally appropriated by dormice.

The young are born in the spring. The family numbers two to four. They are at first blind and



FIG. 34.—The Dormouse asleep (*Mus cardinus avellanarius*).
(Photo. from life by H. C. Wood.)

mouse-grey in colour, except the head and flanks, which are reddish-brown. The adult dormouse, as is well known, is reddish-brown on the back, underneath it is yellowish-white, and it has a white throat. The head and body are $2\frac{1}{2}$ to 3 inches long, and the tail, which is also reddish-brown like the back, with a black tip, is slightly shorter. Dormice are

found all over Central Europe where woodland and forest prevail, from Northern Italy to the south of Sweden. They are unknown in Scotland and Ireland, but in some English counties in the south it is common, while in the north and east it is rare. In Wales it is abundant.

It is in form a stout, round little animal with a big head and very large black eyes. Its habits and appearance are squirrel-like, but it is more nearly allied to the mice. The fore and hind feet are adapted to grasping, though the thumb is rudimentary.

The most favoured food of dormice, as their Latin name implies (*Muscardinus avellanarius*), is hazelnuts, and these nuts form the principal part of the winter store. The dormouse sits up on his haunches, and grasping the nut with forepaws, bites round the rough part of the shell. In addition to hazelnuts he eats acorns, seeds, and fruits, and he likes a little animal food as well, in the shape of small birds' eggs and insects, such as nut weevils, caterpillars, and greenfly or aphides. The pet dormouse greatly enjoys a piece of apple or pear. Dr. Helm says* he found they liked hemp-seeds, nuts, and meat, especially lard. Mr. Millais found that two dormice he kept for a year preferred acorns, nuts, apples, and a piece of bacon-fat now and again.

They remain coiled up in their resting-place during the day and come out only towards evening. Thundery weather seems to make them dormant, but a healthy dormouse is liveliest when he first wakes

* 'Zoologist,' 1888, p. 14.

up in springtime, though it is just at the period of the spring awakening that we so often lose our pets, probably owing to the sudden increased demands on the digestive and respiratory systems, which specially affect those that have been unsuitably fed before hibernation, or those which have been kept too warm or disturbed too much during the dormant period. Strangely enough, this little animal, which appears to us so harmless, was considered in the Middle Ages to be almost as poisonous as the shrew. Topsell, in his 'Four-footed Beasts,' says: "If the viper find their nest, because she cannot eat all the young ones at one time, at the first she filleteth herself with one or two, and putteth out the eyes of all the residue, and afterwards bringeth them meat and nourisheth them, being blind, until the time that the stomach serveth her to eat them every one. But if it happen that, in the meantime, any man chance to light upon these viper-nourished blind dormice, and to kill and eat them, they poison themselves through the venom the viper has left in them. Dormice are bigger in quantity than a squirrel. It is a biting and angry beast."

Another writer of the time of Shakespeare gives a pleasanter account of the dormouse. He says: "Glires be little beasts, as it were great mice, and have that name, for sleep makes them fat. They love their fellows that they know, and strive and fight against each other. And they love their father and mother with great mildness and pity, and feed and serve them in their age." The people of Saxony believe that the dormouse has the same baneful

influence on cattle as the shrew has. If a dormouse but breathe upon a cow its udder becomes diseased.

MICE AND RATS.

Mice and rats form the most extensive family among the rodents. They are limited to the old world, where they are found in every country except Madagascar. All are small animals with large eyes and ears and rudimentary thumbs. The tail is usually long and scaly. There are five representatives of the family in this country : (1) The harvest mouse, (2) the wood mouse, (3) the common house mouse, (4) the black or old English rat, and (5) the Hanoverian brown or grey rat.

They are woefully destructive creatures, especially the house mouse and the grey rat. Nothing is too hard for them to attack with their powerful teeth. They are quick and noiseless in their movements, and their colour helps to preserve them from detection. They are distinguished from the voles by their long scaly tails, pointed muzzles, and large ears.

THE HARVEST MOUSE.

Next to the lesser shrew, the harvest mouse is the smallest British mammal. It is $2\frac{1}{2}$ inches long, and the tail and ears are relatively short. In colour it is reddish yellow on the back and white on the under parts and neck. The feet are naked below, but slightly hairy above.

It was first noticed in England in Wiltshire by Montagu,* but the first description was given by Gilbert White, whose notes are quoted by Pennant in his 'British Quadrupeds.' Gilbert White gives the measurements as, head and body $2\frac{1}{4}$ inches, tail 2 inches, while he says in Letter XIII of the 'Natural History' of Selborne, "Two of them in a scale weighed down just one copper half-penny, which is about the third of an ounce avoirdupois; so that I suppose they are the smallest quadrupeds in this island. A full-grown *mus medius domesticus* (house mouse) weighs, I find, one ounce lumping weight, which is more than six times as much as the mouse above, and measures from nose to rump $4\frac{1}{4}$ inches, and the same in its tail."

This little creature is so shy and alert and has such a keen sense of hearing that it is rarely seen except by the most observant of naturalists, although Gilbert White speaks of having seen a hundred or more under the thatch of an oat rick, but there is no doubt that the animal is very local and scarce. Mr. Millais says that it was abundant fifty years ago in the Weald of Sussex, but that the close-cutting reaping machines have almost exterminated it. Since the principal food of the harvest mouse consists of grain, its present rarity may also be due to the diminished cultivation of cereals in this country. The site usually chosen by the harvest mouse for its nest is a hedgerow bordering a corn-field, and the nests are often found attached to corn-stalks about a foot from the ground. They are com-

* 'Trans. Linn. Soc.,' vol. vii, p. 274.

pact balls of grass and split reeds about the size of an orange. Prof. Schlegel, of Leyden, discovered that harvest mice build winter nests, which differ in form and size from the summer ones. He describes those he found as being built of various mosses and attached to reeds. They were six inches to a foot in height, and three or four inches in diameter, fusiform in shape, resembling the nests of reed warblers. They had no inlet, and the animal in entering had to lift the upper covering.

The young are born naked and blind, and the first coat is brownish-grey in colour, resembling the house mouse. The food of the harvest mouse consists of grains, seeds, and young shoots, and in addition some animal food and water is necessary. They are extremely fond of flies, and are said to devour any insects and also worms. If deprived of animal food they become cannibals.

They may be kept in captivity successfully if carefully fed. "The best receptacle for four or five," Mr. Millais says, "is a bell-shaped aquarium glass, uncovered. The height to which it is safe to allow them to exercise can easily be determined by trial."

In this glass house their playful tricks and gymnastics can be easily watched, and it will be noticed that, unlike any other British mammal, this mouse has a partially prehensile tail. They cannot hold on by the tail for any length of time nor swing by it, but they use it as a back support in coming down a twig or a corn-stalk.

THE WOOD MOUSE.

A profound ignorance prevails respecting the various kinds of mice, and no attempt is made, even by the ordinary intelligent person, to distinguish mice from voles. Field mice are generally distinguished from the house mouse as being bigger, though many countrymen will tell you that the mice in the house come from the fields, and that the change of food and habitation brings about the difference of form. The wood mouse is known as the long-tailed field mouse, and the field vole, which is not really a mouse, as the short-tailed field mouse.

Captain Barrett Hamilton,* who has studied the species, is of opinion that there are as many as nineteen varieties, five of which are found in the British Isles. The typical British wood mouse is tawny-brown in colour above and white below. The bases of the hairs are grey. Sometimes there is a sandy-coloured breast spot, which may extend into a band along the median ventral surface.

The average length of head and body is $3\frac{1}{2}$ to 4 inches, and of the tail nearly the same. The wood mouse may be distinguished from the house mouse by its colour and longer tail, also by its very long white hind feet.

It is abundant everywhere in woodland, hedgerow, and garden, and its race far exceeds in number that of any other British mammal. The ravages it makes on almost every kind of fruit, seed, and bulb are exasperating both to the farmer and gardener, and

* 'Proc. Zool. Soc.,' 1900, pp. 387-428.



FIG. 35.—The Wood Mouse (*Mus sylvaticus intermedius* [Bellamy]). (Photo. by H. C. Wood.)

it increases with extraordinary rapidity, one female producing four or five litters in a season. Curiously enough the ravages of wood mice on hyacinth bulbs



FIG. 36.—Wood Mouse and family. (Photo. by H. C. Wood.)

have taught the Dutch growers a method of increasing their stock. Certain bulbs producing no flowers were examined, and found to have been gnawed to the heart by mice, and in consequence of the injury

they had formed several bulblets, which, on being planted, all flowered in due course. Now the idea has been adopted, and the method of reproducing hyacinth bulbs is to make several cross-cut incisions into them with a knife, and then plant them.

But the wood mouse, like the harvest mouse, likes a spice of animal food, such as gnats, flies, moths, butterflies, and grubs. Mr. Millais* speaks of having discovered some wood mice living in some old copper workings in the New Red Sandstone, and on trapping and dissecting a number of them he found no vegetable matter in their stomachs, but, instead, they were crammed with the bodies of a fly which swarmed in the workings.

The nest is usually made in a burrow in the ground; sometimes deserted mole runs have been used, or old birds' nests adapted to their needs, but the latter are more often used as store-houses for winter supplies. Old nests of the blackbird and thrush are often found filled with hip and haw seeds. Mr. C. Oldham discovered that these stores were made by the wood mouse. He does not eat the pulp of the fruit, but just cracks the seed and eats the kernel.

Mary Howitt, in a poem on the wood mouse, says :

“In the hedge-sparrow’s nest he sits,
When his summer brood is fled,
And picks the berries from the bough
Of the hawthorn overhead.”

The wood mouse makes an excellent pet, to be

* *Loc. cit.*, vol. ii, 191.

preferred before the white mouse, since it does not smell if carefully fed.

Kestrels, owls, stoats, and weasels all prey upon the wood mouse, but these animals are so persistently slaughtered by gamekeepers that the farmer and gardener lose their valuable assistance in restraining the number of mice. Rooks and crows are said to dig up the nests of the wood mice and eat their young. There is a mouse found in Hertfordshire which was described by Mr. E. de Winton in the 'Zoologist' for December, 1894, p. 441. It is larger than the wood mouse, and has a yellow band across its breast. It is said to have three more bones in its tail than the wood mouse has, *i. e.* 30 against 27.

THE HOUSE MOUSE.

It would seem hardly necessary to say much about this mouse, so common and so well known as he is. For those who would wish to distinguish him from the wood mouse, it may be helpful to say that the common mouse is smaller. He is usually greyish-brown in colour, and though there is considerable variation, there is no tone of red in his coat, as in that of the wood mouse. The under parts are covered with a slightly paler fur, but they are not white, and there is no patch on the breast. The eyes and ears are much smaller than those of the wood mouse, and the whiskers are not so full and long. The house mouse has ten *mammæ*, and the wood mouse has only six.

They are such dainty little creatures and play so prettily that one can but regret that they are so foul-smelling and destructive. They will eat anything from paper to bones, and will make their nests in such strange places as a bee-hive, a loaf of bread, or a tin of gunpowder.*

The white and pied mice, waltzing and singing mice, are varieties of the house mouse. Mr. Lydekker says that "singing mice" can run up an octave and end with a decided attempt at a trill. I myself used to watch a mouse who came out every evening in the gloaming from under an old piano, where he seemed to dwell in silence by day listening to the twanging sounds produced by children practising on the instrument. He would squeak out several consecutive notes, as if he were attempting to imitate the musical efforts which had been dinned into his sensitive little ears during the day. But I cannot say I ever heard him accomplish an octave. Sir Harry Johnston says, in his 'British Mammals,' "The singing of these mice resembled the chirping, quavering notes of a young cock canary who is beginning to experiment with his voice."

THE BLACK OR OLD ENGLISH RAT.

So scarce has the black rat become that few people living in inland places are aware that any rats, except the now all too prevalent brown rats, exist in England.

Although the black rat has not been domiciled so

* 'Field,' June 16th, 1894.

long in England as to leave any fossil remains, still we know that it came to this country before the brown rat arrived, that is now so rapidly exterminating it.

Mr. Millais recognises three varieties or subspecies—the Alexandrine rat, the Northern Alexandrine rat, and the black Alexandrine rat. All these are smaller than the brown rat, they have more pointed muzzles, longer tails—as long as head and body together—and longer whiskers. It is probable that the Alexandrine rat is the parent species, and that it was introduced in remote times from the East into Europe. In colouring it resembles the brown rat, but has the characteristic long tail and pointed nose. It is occasionally met with in seaport towns.

The Northern Alexandrine rat was formerly common in England and was known as the “black rat,” but its fur is dark bluish-grey rather than black.

The black Alexandrine rat, which really has a black pelage, would appear to be a recent introduction. It is a native of the Black Sea ports, and has found its way to us on board ship.

All three of these rats are to be found in docks and warehouses of seaport towns, and they occur in the neighbourhood of the London Docks, St. George in the East, and Ratcliffe. It was my habit frequently to walk through Leadenhall Market in the early morning on my way to my work. At that hour the dust-bins belonging to the various shops had not been emptied of their contents. On the top of these I often saw the corpses of numerous tailless rats. Several times I have recognised a striking

difference in the pelage of a particular corpse, and I have carried it off to be skinned for the Whitechapel Museum. One skin had hair on it of a rich jet black, and was almost as soft and long as that of a half Persian cat, so different from the hard coat of a brown rat. As a possible museum specimen I regretted deeply the absence of the tail, but these appendages are taken by the men who catch the rats



FIG. 37.—The Black or old English Rat. (Photo. by H. C. Wood, from a specimen in the British Museum of Natural History.)

to the Mansion House, and they are there rewarded by the Corporation for their efforts in slaughtering these pests. The old English black rat is evidently the blue-grey rat, or Northern Alexandrine rat, whose ravages in granaries and malt-houses was bad enough, but of the two evils we should certainly prefer our old enemy to the brown rat, who is a much more offensive, voracious, and carnivorous creature. The old English rat is certainly attractive in form,

which can hardly be said of the brown rat, who has all but exterminated him.

In his 'Essays on Sport and Natural History' (1883) Mr. J. E. Harting devotes a chapter to the black rat. He tells us that this rat is common in the Channel Islands, and that it reigns supreme in the small island Ile des Marchands, only a few yards from Sark.

As the brown rat was not introduced into England until the close of the seventeenth century all earlier mention of rats must refer to the black rat, which is said to have found its way here from the East, about the time of the Norman Conquest. Giraldus Cambrensis, writing in the twelfth century, records that in the sixth century St. Yvorns cursed the rats in a province of Leinster, probably because they gnawed his books, so that "none were afterwards bred there, or could exist if they were introduced." He also tells of a man in Wales who was persecuted by "the larger species of mice commonly called rats."

The next notice of rats in literature is found in 'Piers Plowman,' written by William Langland about 1362. In the prologue, i, 146, *et seq.*, Langland tells the old fable of the rats and mice trying to hang a bell round the cat's neck, or attempting to bell the cat, to illustrate the struggle between John of Gaunt and the people. The rats represent the chief burghesses or more influential people, the mice those of less importance, and the cat is John of Gaunt. The people loved the young Prince Richard for the sake of his father Edward, the Black Prince, and were jealous lest John of Gaunt, his uncle, should assume kingly power.

The whole story is too long to quote, but is well worth reading. It begins :

“ With that ran ther a route . of ratones at ones
And smale mees myd him . mo than a thousand
And comen to a counseil . for here cumune profit ;
For a cat of a courte . cam when hym liked,
And overlepe hem lighliche . laughte hem at his wille,
And pleyde with hem perilouslych . and possed hem aboute.”

The story of “belling the cat” will also be found among the fables of La Fontaine.

Mr. Millais refers to an interesting notice of black rats given in ‘The Universal Directory for taking alive and destroying Rats, etc.,’ by Robert Smith, Ratcatcher to the Princess Amelia (1768). This gentleman, in the course of his profession, had to contend both with the black and brown rats, and he describes the animosity of the newcomer, which he calls the Norway rat :

“The black ones do not burrow and run into shores as the others do, but chiefly lie in the ceilings and wainscoats, in behind the rafters, and run about the side plates; but their numbers are greatly diminished to what they were formerly, not many of them being left, for the Norway rats always drive them out and kill them whenever they can come at them; as a proof of which I was once exercising my employment at a gentleman’s, and when the night came that I appointed to catch, I set all my traps going, and in the lower part of the house in the cellars I caught the Norway rats, but in the upper part of the house I took nothing but the black rats. I then

put them together into a great cage to keep them alive till the morning, that the gentleman might see them, when the Norway rats killed the black rats immediately and devoured them in my presence."

Pennant, in his 'British Zoology,' 1812, says:

"Among other officers, his British Majesty has a ratcatcher, distinguished by a particular dress, scarlet embroidered with yellow, worked on which are figures of mice destroying wheat sheaves."

THE BROWN RAT.

This is the species commonly known as the rat in England in the present day, but according to Waterton, it was brought to England from the Continent in 1688 with other things which he cordially detested, namely, Hanoverian kings. But this date is by some thought to be a little too early. However, as soon as the brown rat arrived in this country he at once set to work to exterminate his less powerful relations, whom he found located here.

The average brown rat measures about nine inches, taking head and body together, and the tail is about seven and a half inches. They vary, however, considerably in size, some old bucks attaining much larger proportions. The colour of the fur, which is coarse and hard, is usually greyish-brown above and greyish-white below.

His courage and intelligent versatility are remarkable. He will eat all things, animal and vegetable, and his digestive apparatus will find sustenance therein for his hardy and enduring body. In consequence of his

powers of adapting himself to any surroundings, his distribution is cosmopolitan.

It is strange, therefore, that he did not reach this country earlier. Pallas speaks of a great westward movement of the brown rat, noticeable in 1727, when they succeeded in crossing the Volga and conquering Russia and continental Europe. They reached Paris in 1750. Euxleben and Professor Boyd Dawkins give 1730 as the date of the arrival of the brown rat in England.

It will be agreed that this animal does some good as a scavenger in sewers and elsewhere, but in effecting this rats do an infinite amount of harm. They are constantly undermining buildings and stopping up drains, and causing all kinds of similar destruction and inconvenience. During the recent alterations on the north side of the Strand it was found that rats had done damage to the extent of £5000. Behind the wainscot of the bandstand in the Gaiety Restaurant were found the gnawed remains of 1728 serviettes, and wine and beer bottles had been removed to form sleeping places.

The rat inhabitants of the London docks always swarm in numbers, being not only increased by the large families born there, but by constant fresh importations. Men are employed to kill them and burn their carcasses under the eye of an inspector. A fine of £2 is imposed on anyone taking away a rat alive. These restrictions have been made, not only for the purpose of keeping down the numbers of rats, but as a precaution against the spread of bubonic plague.

Formerly there was an official rat-catcher in every



FIG. 38.—The Brown Rat. (Photo. by H. C. Wood.)

town and village, but such an office now seems to be a matter of ancient history, and the rats find considerable freedom in their country life in the fields and hedgerows. Mr. Millais records that a Cambridge-shire farmer killed over 1000 rats per season by simply walking along the lanes with a wire-haired terrier after dark. Seventy or eighty rats per night was no unusual bag and still the plague did not seem to decrease, but owls, kestrels, and weasels are slain and the ratcatcher is a thing of the past. Nearly every country-side could tell the same story.

The rat is extraordinarily prolific. Fresh litters are born every six weeks, numbering from eleven to seventeen or eighteen, the average number being thirteen, and of these seven will be males and six females, the number of males always preponderating. Mr. Millais calculates that one rat might be responsible for the birth of 35,044 rats per year. Starting with her first litter on January 1st, she produces seven males and six females, and she continues to have a litter every six weeks, making eight litters in the year, and every female rat born has a litter when she is three months old. At the end of the year the family would amount to this astonishing number. Fortunately rats are rarely so unmolested as to be able to increase at this rate.

Though inhabiting such filthy places and feeding on the foulest food, the rat is personally a very cleanly animal, and takes considerable pride in his toilet. Sitting up on his haunches he licks his paws and cleans his face much in the same way as a cat does. Owing to the foul nature of his food, however,

the bite of a rat is highly dangerous, frequently proving fatal both to dogs and man.

Many stories are told of rats attacking children and gnawing babies in their cradles, also of their getting into the cabins on board ship and gnawing the nails of passengers sleeping there.

We witnessed the ravages of rats which penetrated a stable at Hindhead. Not only did they consume the leather of the harness, but they gnawed the pony's hoofs right down to the flesh. Some years ago Frank Buckland found that rats were gnawing the feet of the elephants in the Zoo. The nails and quicks were eaten off and the flesh tunnelled. Similar attacks were made on the hippopotamus, who seems to have been successful in crushing his assailants.

Nothing animal or vegetable, alive or dead, is proof against the attacks of rats. House, store, ship, poultry yard and game preserve alike are invaded, and many a time the lives of owl and kestrel have been sacrificed for the misdeeds of rats.

An amusing brochure attributed to an old Indian officer who was a great admirer of the courage and resource of rats is quoted by Mr. Millais :

“A rat was thrown overboard in the Indian Ocean, and the passengers assembled with pleasurable feelings to see it drown. Did it meet its fate with equanimity? Far from it. A gull settled on the sea close to the drowning rodent with joyful anticipation. But the rat at once seized it and killed it, and hoisting one wing of the defunct gull as a sail, waved a paw in farewell to the astonished passengers and sailed for the nearest coast.”

RATS AS PLAGUE CARRIERS.

Many animals, besides rats, are subject to plague, and may become plague carriers. Dogs, cats, pigeons, fowls, and many others are known to be victims, but the predominant importance of the rat as a plague carrier is due to his migratory habits and his close association with man, sometimes in vast hordes. He lives in men's houses and warehouses and travels in their ships.

Both the black and brown rats are susceptible to the disease, but the former is more dangerous since it comes into closer contact with man, living for the most part in ceilings, upper floors and wainscots of houses, while the brown rat inhabits drains, sewers, cellars and stables.

Recent research has taught us, however, that it is not from the plague-stricken rat itself that man catches the disease, but his blood is inoculated with the germ-laden blood of the plague rat through the bites of fleas, which are parasitic upon the sick animal. Without fleas, plague rats and human plague patients would be harmless except in cases of the pneumonic form of plague. The flea is now known to be the all-important agent in causing plague outbreaks.

For much of the information I am able to give on this subject I am indebted to the excellent letters written to the 'Times'* during the time of the rat plague in East Anglia, 1910) by Dr. Louis Sambon,

* "The Rat Plague in East Anglia," 'The Times,' January 30th and February 4th, 1911.

the eminent and learned lecturer to the London School of Tropical Medicine. He says: "I have endeavoured on several occasions to draw attention to the part played by blood-sucking and other household vermin in the transmission of such diseases as measles, smallpox, typhus fever, scarlet fever and mumps."

Rats, cats, dogs, fowls and man each are attacked by different fleas, and although it is popularly said that no flea but *Pulex irritans* will bite man, this theory is erroneous. The peculiar fleas of all these animals bite man and may become disease carriers.

It were a hopeless task to attempt the total extermination of rats. A price has been on their heads or tails for centuries. Wholesale slaughter does but secure more favourable conditions for the multiplication of the survivors. What we want is knowledge, and in addition to knowledge a judicious, thoughtful and constant application of it. During periods of alarm, as that of the autumn of 1910, when East Anglia was threatened with rat plague, a storm of public opinion is excited, which too often dies away before any permanent precautionary measures have been established, to revive only when the evil has again grown to menacing proportions.

Our buildings, wharves and quays should be rat-proof. All rats on ships hailing from infected ports should be destroyed and not one allowed to land. The destruction of the rats only is not sufficient; it must be so arranged as to secure the annihilation of their fleas, suffering none to escape.

The fact that rats are the carriers of plague was

well known to the ancients, but exactly how they carried it has only recently been made known to us, chiefly through the work of Simons, who explained the part played by fleas. At first his rat-flea theory was dismissed by the Indian Commission, but recent experiments undertaken by the Advisory Committee for Plague Investigation in India have proved the flea theory beyond any possible doubt. Thus the danger we have to fight against is not so much the rat, as the flea upon it. Indeed fleas, flies and all insects, which suck our blood and crawl over our food should be taken much more seriously ; they should be regarded in their true light as carriers of disease and death, and every effort made to abolish them from our houses, shops and markets.

I cannot resist quoting one or two of the illustrations Dr. Sambon gives of the knowledge possessed by the ancients of the danger of the rat. He reminds his readers of the golden images of plague buboes and rats which the plague-afflicted Philistines presented as a trespass offering in returning the ark, and describes "the colonial coin of Lucius Verus struck at Pergamum at the time of a plague epidemic whereon Æsculapius, the god of medicine, is represented with a rat at his feet. He takes the place and attributes of a local deity—Apollo Smintheus, the destroyer of rats, 'whose arrows spread the plague.'"

The same author also considers that the consecration of the cat, hawk and snake by the Egyptians was due to the fact that these animals were known to be slayers of the plague-carrying rat. Such a

beneficent faculty may have been one amongst many which we know the Egyptians attributed to these deities, but we believe there were others less material.

The sacred beetle (*Scarabæus sacer*) was venerated, Dr. Sambon says, "because of the habit this animal was known to have of rolling dung into pellets, almost as soon as dropped, and burying it in the soil together with its dung-eating larva. Thus this insect prevents the spread of the *aaa* disease, a grave form of endemic anæmia, which the writer of the Papyrus Ebers 3400 years ago rightly ascribed to the Heltu worm rediscovered in 1838 by Dubius."

During the plague in Rome, 291 B.C., rat-eating snakes were introduced to destroy the pest-carriers. This event Dr. Sambon says is commemorated on a medallion of Antoninus, on which a galley is represented passing beneath a bridge, and from its prow a snake moves towards the figure of the Tiber God, who stretches out his right hand in sign of welcome.

And again the same author describes an illustration of a fresco in Dyer's book on Pompeii, published in 1871, "in which are represented two guardian serpents moving towards an altar placed between them, on which lies the incense-yielding cone, sacred to Æsculapius. Above each snake is a bird darting after a fly. The tails of these birds are considerably shorter than their wings. Their peculiar markings and action, as if hawking flies on the wing, show that they must be intended to represent the common spotted fly-catcher—a bird even at the present day kept in houses in Southern Italy for the purpose of destroying flies."

VOLES OR RED MICE.

The voles differ from mice in possessing more clumsily built bodies and in being less agile in their movements. They have blunt, rounded heads and muzzles, short ears buried in the dense fur, and a short and hairy tail. They have shorter limbs and smaller eyes than those of mice. There are a great many species widely distributed in the Old and New Worlds, five of which are found in the British Isles; three of them being very common. They are all vegetable feeders and live in burrows in meadows and fields, or the banks of ponds and streams. The principal structural difference between the voles and mice is in the teeth. The molar teeth of voles, of which there are three pairs in each jaw, either grow continuously, and are therefore devoid of roots, or they are imperfectly rooted. The grinding surface is divided into cement spaces bordered by enamel ridges.

An examination and report on the local shrews and rodents would form an admirable subject of research for scouts or any class of country boys interested in natural history. The various traps and baits required for each species would have to be discovered and the methods of setting them. However averse we may be to destroying life, there are certain creatures which despoil our homes, our food, and our crops, which must be got rid of. It is our great aim to kill them in such a way as to give them the least pain. To enable us to do this we must study

their ways and habits, know what trap to set for them, and where and how to set it.

For the bank vole Mr. Lydekker recommends a common four-trap made out of three pieces of lath and a couple of roofing tiles with a split bean or piece of cheese as bait. Mr. Millais recommends a common mouse-trap if the vole is only required for study, but to rid the garden of a nuisance he advises the little "nipper" trap baited with bread or cheese, and Mr. Rope says a few hemp-seeds scattered round the trap serve as a useful ground-bait, while I have found a little aniseed is an irresistible attraction. Lemmings belong to the same sub-family of Rodents as the voles. The Norwegian lemmings are strange and interesting beasts, which periodically travel in hordes from the high ground down to the valleys, devastating everything on their track, but never returning whence they came.

The five kinds of English voles are: (1) The bank vole, (2) the field vole, (3) water vole, (4) the Orkney vole, (5) the Skomer vole. Of these the first three kinds are widespread, while the rest are local.

THE BANK VOLE.

This animal is the most mouse-like of the voles both in form and habits. It has a more pointed muzzle than the field vole and a longer tail. The head and body together measure 3 to 4 inches and the tail about one half this length. The back is rich reddish-chestnut, the flanks grey, and the under part white. The molars of the adult have forked roots

and the angles of the cement spaces are rounded, whereas the field vole has molars with simple roots and with the enamel walls of the cement spaces ending in sharp prismatic angles.

The bank vole was first described as a native animal by Yarrel in 1832. It is found in England, Scotland, and Wales, but not in Ireland. It lives in burrows, which it prefers to make in ivy-covered hedge banks, and especially favours those that are intersected with old roots. Bank voles also make use of old mole-runs.

From the hedgerows the bank or red vole finds its way into gardens and devours crocus bulbs. Of 1000 put into a bank in our garden, only about five escaped the jaws of this vole. They will also eat newly sown peas and beans and fruit, and often do considerable damage to trees by gnawing the bark. Like lemmings they periodically breed in such vast numbers as to produce a plague. Such a plague of bank voles occurred in the Forest of Dean in 1813–14, when numbers of hollies, young oaks and chestnuts were barked near the ground, and, being the best climbers of all the voles, they gnawed the bark at 3 feet to 4 feet up. All kinds of remedies were used, but the most effective were holes dug 18 inches to 20 inches wide at bottom, 2 feet long, $1\frac{1}{2}$ feet deep, and 9 inches wide at the top. When the voles had fallen into these pits they could not climb up the inward-sloping sides. About 30,000 were thus caught during one autumn, and it was calculated that during the three or four months of their visitation 200,000 were killed.

They feed chiefly at night, but in springtime may often be seen during the day. Their chief food in a wild state consists of grass, roots, dandelion leaves, sheep's parsley, plaintain and hogweed, wild anemone roots, acorns and nuts of various kinds. Mr. Rope says that, curiously enough, they do not like carrots, of which other voles are very fond, but they will eat Brussels sprouts, and bank voles in captivity refuse crocus bulbs.

THE FIELD VOLE OR SHORT-TAILED FIELD MOUSE.

This vole is slightly larger than the bank vole. It has a shorter tail and is not so red in colour. Its muzzle is rounder. The head and body measure $3\frac{1}{2}$ to $4\frac{1}{2}$ inches and the tail about one third of this length. It may be finally identified from the bank vole by the structure of its molar teeth. The field vole is found in England, Scotland and Wales, but is unknown in Ireland. It lives in the rough grass on low-lying land and in damp plantations. Mr. Millais says that he has devoted about a fifth of an acre of his garden to a colony of field voles. He finds they increase somewhat rapidly and do little damage, as they seem to live exclusively on grass. Each pair has a separate run where they rear their young and store their winter food. The burrows are very clean and devoid of smell. They soon become tame if kept as pets, and will allow themselves to be handled. "They are said to eat almost anything in the way of fruits, nuts, grain, young leaves, seeds and grass," says Mr. Millais, "and I

have found they enjoy almost any vegetable substance when hungry, but prefer sweet grass, clover and carrots to all other food. A supply of water is, however, essential to them."

Plagues of field voles have been recorded in history, and several references to these records are given by Mr. J. E. Harting.

In the 'Historia Animalium' Aristotle speaks of the destruction caused by mice more than 2000 years ago.*

"There is a doubt respecting the reproduction and destruction of the mice which live on the ground, for such an inexpressible number of field mice have sometimes made their appearance that very little food remained. Their power of destruction is so great that some small farmers, having on one day observed that their corn was ready for harvest, when they went the following day to cut their corn found it all eaten. The manner of their disappearance also is unaccountable; for in a few days they all vanished although beforehand they could not be exterminated by smoking and digging them out, nor by hunting them and turning swine among them to root up their runs. Foxes also hunt them out, and wild weasels are very ready to destroy them; but they cannot prevail over their numbers and the rapidity of their increase, nor, indeed, can anything prevail over them but rain, and when this comes they disappear very soon."

Mr. Millais also speaks of the account given by Herodotus ('Euterpe' II, 141) of the defeat of the

* Bohn's edition and translation, p. 187.

army of Sennacherib in consequence of the destruction by field mice, during the night, of their quivers, arrows and bow-strings, which were rendered useless by gnawing.

“Apollo Smintheus, or Apollo the Mouse God,” says Mr. Millais, “was regarded as the author and averter of the various plagues of field mice from which Greece suffered.” He also quotes the ‘Stony-

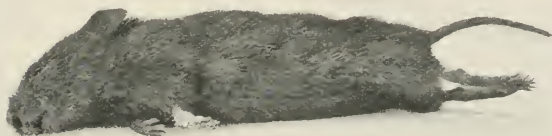


FIG. 39.—Field Vole or Short-tailed Field Mouse
(*Microtus agrestis*).

hurst Magazine,’ December, 1892: “Finally, there is another aspect in which we may regard the mouse, and one in which it is even more closely connected with the religious ideas of the ancients, namely, as a harbinger of good and evil tidings from the gods, that is to say, the announcer of their satisfaction or displeasure.” With this belief about the mouse we may compare the Scandinavian belief about the squirrel.

The origin of these vole plagues is not understood.

For years voles may exist in any locality in numbers, which do not effect any inordinate damage, but quite suddenly a season especially favourable to them may occur when "they come upon the earth," says Blasius, "as if by magic in their tens of thousands. A mild winter and an unusual abundance of good grass may perhaps account for it. Many instances are known in which a great part of the harvest has been destroyed over large tracts of country by their inordinate increase, and more than a thousand acres of young birch trees have been destroyed by their gnawing the bark." During the second decade of the nineteenth century several vole plagues visited the Lower Rhine, and Brehm says: "The fields were so undermined in places that you could scarcely set foot on the ground without touching a vole-hole, and innumerable paths were deeply trodden between these openings. On fine days it swarmed with voles, which ran about openly and fearlessly. If they were approached from six to ten rushed to the same hole to creep in. It was not difficult in the crush to kill half a dozen with one blow from a stick. All seemed to be strong and healthy, but mostly rather small, and for the greater part were probably young ones. Three weeks after I revisited the place. The number of voles had actually increased, but the animals were apparently in a sickly state. Many had mangy places or sores over the whole body, and even in those which appeared sound, the skin was so loose and delicate that it could not be roughly handled without destroying it. When I visited the place for the third time, four weeks later, every trace of them had

disappeared; but the empty burrows and passages awakened a much more dismal feeling than when they swarmed with life. People said that the whole race had suddenly disappeared from the earth, as if by magic. Many may have perished from a devastating pestilence, and many may have been devoured by their fellows, as happens in captivity; but people also spoke of the innumerable hosts that had swum across the Rhine at several places in the open daylight. No extraordinary increase was noticed over a wide area, but they seem to have disappeared everywhere at the same time, without reappearing elsewhere. Nature must have put a stop to their inordinate multiplication at the same period. It was fine, warm autumn weather, apparently favourable to them to the last moment."

In 1822, in the district of Zabern, 1,570,000 voles were caught in fourteen days; and in the district of Nidda, 590,427; and in that of Putzbach, 271,941.

In 1856 a plague of voles in the district between Erfurt and Gotha destroyed crops, the value of which amounted to over £4,000. Again in 1872 and 1873 the voles visited Lower Saxony and Thuringia, where half the harvest was destroyed and thousands of acres were left untilled. In 1892 Thessaly was devastated by voles, but a far more serious outbreak occurred in France in 1904 in the district between the Loire and the Gironde. "In the Northern part of Charente, where the plague is most serious, the damage done by the voles is said to be enormous. The surface of the ground is riddled with holes like a sieve. Not only will it be impossible to feed the

stock on the farms, but the farmers themselves will be deprived of their ordinary food supply.”* This outbreak was treated with a virus supplied by M. Danysz of the Pasteur Institute. In principle this treatment was the same as that used by Professor Loeffler in Thessaly during the vole plague of 1892. Thousands died who ate the virus, but it failed to produce any contagious disease.

Similar plagues have taken place in England and Scotland. Hollinshed, in his chronicle, records one as having occurred in 1580 in the Hundred of Danesay in Essex.

“About Hallowtide last past (1581) in the marshes of Danesay Hundred, in a place called South Minster, in the County of Essex, there sodainlie appeared an infinite number of mice, which overwhelming the whole earth in the said marshes, did sheare and gnaw the grass by the rootes, spoyling and tainting the same with their venomous teeth, in such sort that the cattell which grazed thereon were smitten with a murraine and died thereof; which vermin by policie of men could not be destroyed, till at the last there flocked together such a number of owles as all the shire was not able to yield, whereby the marsh holders were shortly delivered from the vexation of the said mice.”

Stowe says a similar plague occurred in Kent in 1615. Childrey, in ‘*Britannia Baconica*’ (1660), mentions another outbreak in Essex in 1648, and Lilley yet another in Essex in 1660, of which plague Fuller says :

* ‘Field,’ April 23rd, 1904.

“An army of mice resting in the anthills as conies in burrows, shaved off the grass at the bare roots, which withering to dung, was infectious to cattle. In March following numberless flocks of owls from all parts flew thither and destroyed them, which otherwise had ruined the country if continuing another year.”

A plague of mice occurred at Downham Market in Norfolk in 1754 and Montagu mentions in his ‘Ornithological Dictionary’ (1813) a similar plague at Bridgewater as occurring a few years previously.

So serious was the plague of voles in Scotland, especially in Dumfriesshire and Roxburghshire, where between 80,000 and 90,000 acres were overrun by these small creatures, that a Government committee, under the presidency of Sir Herbert Maxwell, was appointed in May, 1892, to inquire and report upon this plague in the south of Scotland. Much evidence was taken which went to prove that the undue increase of “field mice” was in a great measure due to the destruction of their natural enemies, in the shape of owls, hawks, weasels and stoats. “The general remarks,” says Mr. Millais, “of farmers, shepherds, land agents, naturalists, and even gamekeepers all tended to show that, through the destruction of raptorial birds and small carnivora, the balance of nature had been upset.”

Mr. Harting, writing in the ‘Field,’ May, 1904, says, “Nothing was more abundantly proved in the Scottish inquiry than the fact that the greatest check on the undue increase of field voles was removed by the indiscriminate destruction of so-called

vermin. Hawks, owls, stoats, weasels, foxes, rooks and even adders all prey largely on field mice, and on the farms where these creatures were systematically trapped the ground was overrun with voles, to the great destruction of grass and starvation of sheep. Rooks were found to be particularly useful in digging out the voles' nests and devouring the young ones."

At the risk of being tedious I have quoted various writers on the subject of vole plagues, because this capacity common to the voles, hamsters, and lemmings of increasing their numbers occasionally to countless hosts is of considerable interest. The interest grows, too, when we find that history records that our ancestors suffered from similar plagues. Of the plagues of voles in remote times we have no report of an investigating committee, but we do learn that what were believed to be the contributory causes then are still so regarded. They are (1) seasonal peculiarities specially favourably to the increase of small mammals, as a moist autumn with plenty of grass for winter cover, followed by a mild winter and a dry spring; (2) the absence of owls and buzzards, and other animals that prey upon mice. Thus by a thoughtless destruction of one kind of animals, we may so upset the economy of Nature as to produce a plague of another kind.

When contemplating voles and vole plagues, one cannot fail to be reminded of Browning's poem of the "Pied Piper," who undertook, in the year 1366, to rid the town of Hamelin of a plague of rats. The story tells how the Piper lured the rodents by his piping to their death by drowning in the Weser.

All perished save one. For the account of the fatal consequences which befell the townspeople who failed to complete their bargain with the Piper I would refer you to the poem.

THE WATER VOLE.

This is the largest of the English voles, and is often called the water rat. The want of observation that prevails causes people to confuse this harmless animal with the brown rat, which often lives by the waterside and in damp ditches.

The water vole measures eight and a quarter inches from the tip of the nose to the root of the tail, and the tail is usually about half this length. The head is short and broad, and the fur is thick and long, and has a greyish-brown appearance. The shorter hairs are grey on the upper parts and brown on the lower parts; the longer hairs are all sandy brown. The hairs on the tail are black and sometimes there is a white tip. The ears are short and round, and naked internally. An operculum closes the aperture of the internal ear. The toes are naked and are not webbed. The incisor teeth are brownish yellow, and the claws are yellow with purple lines above. There are two musk-glands situated immediately in front of the hind legs. These glands are peculiar to the sub-genus (*Arvicol*a) to which the water vole belongs. They are oval in shape, with their long axes lying along the body.

The water vole is widely distributed both in the

new and old world. It is common in England, Wales, and Scotland, but is unknown in Ireland. The black or melanotic variety prevails largely in the fens of Cambridgeshire and in Scotland.

The long, winding burrows of the water vole are made in the banks of rivers, canals, and mill-dams, where it will sometimes do damage by undermining the banks.

It is not a newcomer as the black and brown rats are, but is an old inhabitant, since its bones are found fossil in the forest beds of Norfolk and the brick earths of the Thames Valley.

The food of the water vole consists mainly of water plants, and though such a keen observer of Nature as Mr. Harting maintains that he is a strict vegetarian, other naturalists have accused him of taking a certain amount of animal food in the shape of fish, flesh, and molluscs. Isaak Walton calls the "Craber" (water vole) a fish destroyer with whom "any honest man might make a just quarrel."

The nest is made of grass, bitten up into small pieces, and the young, which number from five to eight, are usually seen about June. The mother will often carry her young as a cat does her kittens, and if swimming with them, will hold them high out of the water, unlike the otter, who carries them beneath the surface.

They appear to rest about mid-day, and come out in the morning and evening. Mr. Millais says, "They are wonderfully quiet and peaceable animals, and love to sit for hours lost in a 'brown' study."

When feeding the water voles sit on their hind

legs and hold their food in their fore paws, after the manner of squirrels. They are excellent swimmers from an early age and will sometimes swim on the surface, exposing the head and back, but if alarmed they will sink their bodies and keep the nose only above water. Often, too, they may be seen, as Mr. Trevor Battye has observed, swimming with their hind feet only, like a beaver or a seal.



FIG. 40.—The Water Vole (*Microtus amphibius*). (Photo. by H. C. Wood, from a specimen in the British Museum of Natural History.)

Mr. Douglas English has kept water voles in captivity, and finds that a liberal supply of water, sufficient for a plunge bath, is essential to their welfare, otherwise the oily matter which is secreted round their eyelids solidifies and they are practically blinded. Mr. Douglas English kept his water voles in a galvanised iron tank, “tilted so as to ensure six inches in depth of water at one end and *terra firma* at the other.” The same writer says they are the only

animals he has ever seen which can reach and dress their hind quarters with their own hind feet.

In summer the water vole eats the succulent portions of the stems of flags and horse tails (*Equisetum*), duck-weed, American pond-weed, marsh marigold, and water-lily roots. In hard weather he will raid the farmer's root crops and potatoes, and will often do damage by gnawing the bark of willows and osiers. He does not hibernate all the winter, but is inactive in very severe weather.

The only plague of water voles that is known occurred in 1896, on Reed Island in the Humber. This island was reclaimed from the sea, and consisted of 600 acres of rich grass and clover land, on which 2000 to 3000 sheep and cattle were grazed. It was rendered perfectly brown and bare by the water voles.

HARES AND RABBITS.

These two rodents, which are the largest members of the family inhabiting Britain, may be distinguished by their colour, size, and habits. They resemble each other, and differ from other rodents in having four incisor teeth in the upper jaw. The second pair are smaller than the central pair, and are placed immediately behind them. Hares and rabbits have collar bones, but these are imperfectly formed. The feet are hairy beneath, and they have five toes on the fore feet and four on the hind feet. The ears are longer and the tail shorter than those of other rodents, and the hairy coat enters the cavity of the mouth,

the cheeks being covered with hair within the mouth as well as without.

The rabbit differs from the hare in having shorter ears and legs. It lives in burrows of its own making, and its young are born naked and blind, while the offspring of the hare are born covered with hair, in the "form" or customary resting-place of the mother. Their eyes are open and they are very soon able to run about.

There are certain anatomical details also in which these rodents differ, especially in the structure of the skull and of the cæcum or large intestine.

The rabbit (*Lepus cuniculus*), it is believed, was introduced by man at some remote period into Britain. Its native home is the Spanish Peninsula, the south of France, and some of the Mediterranean islands. It is now widely distributed in England, Ireland, and Scotland; and though in many places rabbits are regarded as troublesome vermin, their introduction to this country has not proved so disastrous as their importation into Australia and New Zealand.

Rabbits are social creatures, living in communities, while the hare is a solitary animal. They increase with enormous rapidity. Each litter, of which there are often as many as six in a year, numbers five to eight young ones, and they begin to breed when six or eight months old. Before the young are born the mother leaves the home burrow, and, often travelling some distance from it, she scratches out a fresh one, at the end of which she makes a hollow to form the nest, which she lines with fur from her own

body. In this rabbit nursery, usually called a "stab," the blind, naked, helpless young are born. When she leaves them she scratches the earth or sand over them to cover them, her great idea being to protect them from the old male rabbits. She often dispenses with a burrow, and the "stab" is merely a slight cavity in the ground at some distance from the main colony. The eyes of the young rabbits are opened on the eleventh day and the ears on the twelfth; on the thirteenth day they can erect the ears.

"To understand the ways of wild rabbits," Mr. Millais* says, "and to be on terms of the closest intimacy with them, it is only necessary to climb into a tree above and in front of some large burrow near the edge of a wood. As evening draws on the rabbits will come out from the wood and pass under your tree to the good grass beyond. From May to August every year I spend three evenings a week 'up a tree' somewhere on the edge of St. Leonard's Forest, and thus enjoy Nature without creating much disturbance. There are various methods of shooting rabbits, but none in my opinion compare with the use of the .22 Winchester rifle, smokeless cartridges, and a high power American telescopic sight. Your shots are practically noiseless, you can select young rabbits by means of the glass, and you have a shooting range up to sixty yards . . . The secret of success is never to move or show yourself after the shot." Those who take Mr. Millais' advice and spend a few evenings "up a tree" will soon learn more than books can teach.

* 'Mammals of Great Britain and Ireland,' vol. iii, p. 47.

Both rabbits and hares are mesmerised by the approach of stoat or weasel, and will sit with closed eyes and calmly submit themselves to the slaughterer. But a remarkable courage, born of mother love, will prompt the doe rabbit to turn on the would-be murderer of her young ones.

Fear will sometimes prompt a rabbit to take to the water, but this means of escape is more often resorted to by the hare.

Bunny, as so many of us know to our cost, will eat almost anything that is green. Mr. Harting, in his monograph on the rabbit in the "Fin, Fur and Feather" series, gives a very useful list of shrubs which may be grown as covert and are said not to be eaten by rabbits. One plant on the list, however, *Pernettya mucronata*, has suffered a severe pruning by rabbits in our garden.

In hard weather rabbits will eat the bark and shoots of laurels and privet, which are generally regarded as poisonous to most animals; the young shoots of holly and the bark of hazel, ash, birch, Scot's pine and young oak are unmercifully consumed. They turn the heart of any gardener to stone by nibbling the growing shoots out of his choicest plants and rooting up others. Pinks and carnations are eaten to the ground first, then sweet Williams, wall flowers, and a variety of other plants are attacked. In Epping Forest the holly bushes look as if they had been regularly clipped to a height of about eighteen inches above the ground. This pruning is effected by the rabbits eating all the young holly shoots within their reach.

Among the many enemies of the rabbit are stoats, weasels, foxes, the larger birds of prey, and occasionally the domestic cat. Young rabbits fall victims to the owl, the raven, the carrion crow, and the hoody or saddle-back crow.

Mr. Millais, quoting some notes on the rabbit given him by Colonel E. A. Butler, says: "There are several ways of distinguishing buck rabbits from does when they are out feeding in the summer time. The bucks carry their tails higher, so that the white shows much more conspicuously when they are moving. Then, again, the bucks are more restless than the does, constantly fidgetting about and scratching little holes. Does, as a rule, feed much more in the day time in summer than the bucks, creeping cautiously out of the covert and commencing to feed at once, whereas the bucks come out later in the day, often not before dusk, running out boldly into the field with a hop, skip and jump, before settling down to feed. On these occasions they have a peculiar habit, when two meet, of jumping into the air. Bucks, too, have a way of rubbing their heads fawningly against anything they may come across, such as a stone, a dead branch, or an old stump of a tree, possibly near which a doe has been feeding."

There are many ways of catching rabbits, but, as Mr. Millais says, a fortune awaits the man who can invent a rabbit trap which is not cruel. "The fearful suffering inflicted on rabbits and all other quadrupeds and bipeds that get into the teeth of the common gin is dreadful to think of, and a subject of regret to all humane men. Funds for the invention

of some merciful engine of capture have been raised and offered to the inventor, but so far we seem to be as far off the day of the 'happy despatch' as ever. Such a trap must, of course, be quite as certain in its efficiency as the gin, but it should either catch alive or strike dead, and I think that the Government which professes to be humanitarian should offer a large reward for such an invention, and entirely prohibit the use of the gin and the common wire snare, which is almost equally cruel."

Dry, sandy ground, with cover of heather or long grass, is peculiarly favoured by rabbits. On such ground the warrens, as the colonies are called, are literally alive with rabbits in the morning and evening, when they come out of their burrows to feed. With the slightest noise they scamper home, cocking their short tails, which are white beneath, to point the way to those behind them. They scurry away down their holes, just as if they had suddenly thought of an appointment and feared to be too late for it, as the white rabbit was in 'Alice in Wonderland.'

Rabbits are subject to many diseases, most of them being due to inbreeding and exhausted ground, but they often suffer from some malformation of the incisors, caused by the upper ones not grinding properly on the lower ones. One of the teeth often grows out to a considerable length, frequently penetrating the skull. The sufferer is prevented from feeding properly, and finally dies of starvation.

The name "rabbit" was formerly spelt "rabbet," and in old English, "rabbette." Professor Herbert

Strong thinks the word was only applied to the young of the coney. Mr. Millais says, "the word '*cuniculus*,' adopted by the Romans, may be derived from '*cuneus*,' a wedge, as being applicable to an animal which could drive holes in the ground with ease."

Varro and Pliny thought the animal derived its name from the military mines (*cuniculi*) by means of which towns were attacked, but more probably it was the other way on, since Martial and other authorities considered that these rodents first taught men how to undermine towns.

The fur of the rabbit is more extensively used in the fur trade than any other skin, except those of the musk rat and squirrel. As many as 30,000,000 skins are collected in England, while French and Belgian skins number 2,000,000.

THE HARE.

The hare is tawny grey, tinged with red on the upper parts and white beneath. The tail, which is three and a half inches long, is black above and white beneath. The long ears are tipped with black and the *vibrissæ* are yellowish white. The length of the head and body is from twenty-one to twenty-three inches, while those of the rabbit measure about sixteen inches. The colour of the fur is always changing, and there is a distinct moult between July and September. Leverets, or young hares, are always redder than the adults. The hairs as they first grow out of the skin, says Mr. Drane,

are black. When they are an eighth of an inch long the tips turn brown, giving the animal its general rufous appearance, yet when fully developed the basal portion of each hair is white. The eye of the hare is large and prominent. Mr. Millais describes it as "a hard, cold, uninteresting eye," and quotes Zola, who speaks of it as "a bleak and frigid stare, which does not seem to see; an ever-haunting, absent look, as of one whom her sufferings overwhelmed." "Its iris," says Mr. Drane, "does not contract as in the cat's eye and hawk's eye, giving great variety of expression, but it glows like those of the Felidæ."

Hares have huge incisor teeth, which they may often be heard in the act of grinding down when in repose. To assist them in this process they need coarse sand, which serves them also as a mechanical digestive and laxative.

The hare common in England and Scotland is known as *Lepus europæus*. This species extends all over Europe, except the extreme north of Russia and Scandinavia, but curiously enough it is not the hare of Ireland, and all attempts to acclimatise it there have failed. The Irish hare is the variable hare, *Lepus timidus hibernicus* (Yarr), a variety of the mountain or blue hare, found in the hilly districts of Scotland, and known as *Lepus timidus* (Linnæus).

The mountain hare is common in other parts of Europe, and extends as far east as Japan.

Hares frequent open cultivated lands and bare hills. During the day the hare sits crouched up and

solitary in its "form"—a selected spot for repose on the ground, usually covered by long grass or growing corn.

The hare is more particular about its food than the rabbit. It will eat grass, clover, corn, and turnips, but will carefully peel the turnips before eating them, leaving the peel on the ground. In this way the robber can be detected, for the rabbit eats the turnip, peel and all. Mr. Millais says hares eat quantities of meadow grass, *Poa pratensis*, *Festuca rubra*, and *Trifolium medium*, sow thistles and dandelions. Like rabbits they make raids on the flower garden, eating carnations and pinks, wall-flowers and nasturtiums, and they will often go down to the sea shore to eat the sea pea (*Lathyrus maritima*).

Mr. Drane, who has kept hares in captivity for many years, has discovered many things concerning the habits and characteristics of his pets. His fascinating account * of the hare should be read by all nature students.

He has studied the habit attributed to the hare, even in the Bible (Levit. XI, 6) and elsewhere, of chewing the cud. "And the hare because he cheweth the cud, and divideth not the hoof, he is unclean to you." Mr. Drane believes that the hare was thought to be chewing the cud when he was really only grinding his teeth, a practice we have referred to above. The same author says: "What seems really to occur is this: the creature is essentially nocturnal, feeding mainly between 7 p.m. and 7 a.m., but chiefly

* 'Trans. Cardiff Naturalists' Soc.,' vol. xxvii, Part II, 1894-5.

from 9 to 12. It then fills its stomach pack-full and keeps it full while partial digestion proceeds rapidly; the half-digested food passes down a long narrow canal, and enters a kind of second stomach; when both are replete it ceases eating, retires some distance from its feeding ground, and spends the major part of the day in perfect quiescence, digesting perfectly this store of food. During this period certain portions of food in the form of imperfectly exhausted, soft, mucilaginous pellets are extruded from time to time and received by the animal directly into its mouth on extrusion from the rectum; they are swallowed without anything deserving to be called mastication—a movement or two of the jaws—and passed a second time through its digestive canal. This continues to go on until I imagine the whole of the food has thus passed through, and I think it is not till then that the pellets of the ordinary dung assume their ultimate form, size and consistence, that is, hard and almost perfectly desiccated.” Thus the same author says: “This delicately clean, odourless and elegant creature has one unpleasing habit! it eats its own dung, even when supplied with abundance of acceptable and favourite food. Not only does it eat the soft pellets above referred to, but it undoubtedly eats also, to a limited extent, the perfectly digested and desiccated pellets of its ordinary dung.”

Such was Mr. Drane’s interest in his pets that his house and household goods appear to have been abandoned to them. Speaking of one of his tame hares, he says: “It likes to be with me, and delights

to jump upon the bed, over and under, and upon it again and again, and I have become so fond of it and accustomed to it that it does not disturb me at all. It will almost every morning, when its period of nocturnal activity ceases, get under the bed-clothes to enjoy the warmth, and then it will wake me by burrowing furiously ; it tears away at imaginary excavations, and throws out imaginary earth precisely as a rabbit does in its real work, 'washing its hands with invisible soap in imperceptible water.' In these imaginary burrowings it meets with imaginary roots or other obstructions which it bites through. That in prosaic English means just so many holes in the sheet, but the creature is so lovable that I would much rather have half a hare than a whole sheet. This burrowing seems to me an instinctive harking back to that remote period in this creature's evolution when it lived in holes as its congeners do." The rabbits of Australia and New Zealand are abandoning the precaution of living in burrows, since there are in those countries practically no carnivorous animals to contend against.

Whereas the dog pants to perspire and to cool himself, "the hare," says Mr. Drane "pants with enjoyment and apparently to warm himself, for his temperature which is normally 98° F. rapidly rises to 106° F."

The external form of the hare is eminently adapted to speed, and in this respect can be compared with the form of the cat. Although the collar bone is not entirely absent, as is the case with the cat, the hare's collar bone is small and rudimentary and the body is

compressed, thus presenting the least possible resistance to the air. With its long and powerful hind legs the animal advances by enormous leaps, its strong claws enabling it to get a firm hold of the ground as fulcrum. These leaps when the animal is running at ease are about four feet in length, but under the influence of fear its stride is extended to ten and sometimes twelve feet, and it has been said that a hare will jump fen ditches twenty to twenty-five feet in width.

Both the cat and the hare have very flexible back-bones, which enable them to twist their bodies and alter the direction of their course with great ease even when going at a high rate of speed. This action is known as "doubling," at which the hare is an adept, and it gives the creature an immense advantage when being chased by a stiff-backed animal like the dog. The long hind legs enable the hare to go rapidly up hill, but chased down-hill hares frequently topple head over heels. Its speed is the hare's only means of defence, but even this would not save it from extermination were it not for its extreme fecundity. Hares breed from April to August, as a rule, but in mild seasons leverets have been found almost in every month of the year. The pairing takes place in February and March, when the extraordinary courting antics of the buck have given rise to the belief that he is mad, and to the saying, "As mad as a March hare." There is considerable fighting also at this season among the bucks for their mates, and so severe are the blows dealt with the hind legs and so fatal the drumming of the fore

feet on the fallen foe, that the victor leaves his rival dead on the field.

The litters usually number three to five, while in some districts peculiarly favourable to hares as many as eight young have been recorded in one litter.

The young leverets are born with furry coats, and with the sense of sight, and are very soon able to move about. Soon after birth, however, the mother moves her young ones, placing each in a separate "form," and visits each in turn at night to feed it.

Hares would appear to be particularly silent animals, uttering no sound except the scream of fear so well known to all sportsmen. Authorities, however, differ as to the sounds emitted by them. The Rev. E. A. Woodruffe Peacock speaks of a peculiar grunting and hissing sound made with closed lips when the bucks are fighting or when driving off grazing sheep and cattle, of whom they have no fear, by boxing them on the head or nose with their forefeet. Mr. Millais also records an observation made by a keeper in the employ of Sir Richard Graham, who stated that the doe makes a noise between a grunt and a whistle when running to her young ones in their forms, and with a similar call she brings them to her.

Mr. Drane, writing of the cries of fear, says: "Both sounds are uttered with wide open mouth and resemble the repeated word 'arnt,' or, if you will, 'aunt.' I believe this is the only open-mouthed voice of the hare. But it emits other sounds with a variety of meanings with closed mouth, which resemble our contraction 'don't,' 'oont' and 'ont.'

I can always make my hares say 'don't' as we say 'humph' without opening our lips. This is done by a quick movement of the hand, as if to seize the creature suddenly. If the same movement is made slowly no sound is emitted."

The same observer states that he does not think adult hares call one another, but he thinks does call their young with the sound "oont," but so very faintly that it would be necessary to be much nearer to them than would ever be possible in a wild state to detect it at all.

We find a further instance of Mr. Drane's sacrifice of his house and household goods to his hares, for he says: "I had two hares in captivity which twice produced young. I gave them the run of my house at night: my bedroom opens on the corridor, and the door is never shut at night. The parent hares held high jinks upstairs and down, along the corridor, and in and out of my bedroom. The little ones could not keep pace at all with them and would lie *perdu*. Then in the unbroken silence of the night, and within walls which would help to convey the slightest sound, I have heard the mother hare call her young by a whispered 'oont,' and have heard the response in the soft tread of the little one along the waxed floor, very different from the distinct sound made by the long hard nails of the parents.

"Few people are probably conscious of the extreme sensitiveness of hearing and smelling in the hare, and I doubt not that, although inaudible to us, the doe's call to her young is relatively loud."

It was a subject of popular belief that hares do

make some cry, for instruments known as "hare-pipes" must have been used by poachers to lure hares as long ago as the reign of Richard II, since the game laws of 13 Rich. II ch. 13 prohibited the use by unauthorised persons of dogs for hunting, ferrets, nets, hare-pipes, or other engines to take or destroy hares, etc., and in James I's time the statute 1 Jac. c. 27 enacted that every person who should at any time take, or destroy any hares with hare-pipes, cords, or any such instruments or other engines should forfeit for every hare so taken or destroyed 20s. This prohibition of the use of hare-pipes was continued by 22 and 23 Car. II c. 25 as well as by 4 and 5 William and Mary c. 23, and only dropped out of the statute book in 1831, when these and other game laws were repealed on the passing of what is now known as the principal Game Act 1 and 2 Will. IV c. 32. These facts were recorded by Mr. J. E. Harting in the 'Field,' March 4th, 1905, who further states that: "French poachers at the present day call the buck hares in the month of March by imitating with an ivy leaf the cry of the doe."

Dr. Murray defines the hare-pipe as a trap for catching hares, and his quotations on the subject range from 1389 to 1821.

Mr. Henry Scherren, in writing of the hare-pipe, quotes 'The Early English Miscellany':

"I have a hare-pype in purce,
It shall be set all for thi sake."

And Tuberville's 'Venerie' (1575), p. 200: "Also it is possible to take them (otters) under the water,

and by the river's side both in traps and in snares, as you take a hare with hare-pipes or such like gins."

Mr. Harting refers to the treatise on 'Agriculture by John Worlege' (1669), p. 209: "The hare is no great destroyer of corn, yet where there are many of them the countryman may lessen their number as he sees cause: either by hunting or coursing them at seasonable times or by setting of hare-pipes where he finds their haunts, or by tracing them in the snow."

Mr. Drane has recorded, in a note to Mr. Millais, a curious habit of the hare. When warm, quite well and happy, "it will have a spasmodic attack convulsing the whole body, which seems exactly like our sneezing. It sneezes violently but without noise of any kind—just as one would do, say, in church—by keeping the mouth shut. If the hare sneezed aloud it would betray its presence to the enemy."

Speaking of the attitudes of the hare Mr. Drane says: "But perhaps the prettiest thing of all is to see it clean its ears. It puts its head on one side, pulls down its ear, and passes its two paws over it most strikingly like a lady dressing her hair. It can stand quite perpendicular, without support, upon its hind toes, and even advance some steps in that position, balancing itself by holding out its fore limbs horizontally. Its leaps are remarkable for their height, grace, and agility. It habitually overleaps its object and comes down upon it with a curved descent as beautifully as an antelope, thus contrasting with the cat, which scarce jumps up to the necessary height, whilst the hare overleaps it."

The hare is the subject of many fables and folk tales in various parts of the world. Some speak of her as "the gentle hare," others regard her as gay, lively, grave or pernicious. In Greek and Roman tales it is "the timid one," and many superstitions are recorded relating to it and its strange medicinal properties.

We are told by William Borlase in his 'Antiquities of Cornwall,' p. 135, how Boadicea, Queen of the Britons, when she had harangued her soldiers to spirit them up against the Romans, opened her bosom and let go a hare, which she had there concealed, that the augurs might thence proceed to divine. The frightened animal made such turnings and windings in her course, as according to the rules of judging prognosticated happy success. The joyful multitude made loud huzzas; Boadicea seized the opportunity, approved their valour, led them straight to their enemies, and gained the victory."

The ancient Britons used hares only for divination. They were never eaten. The Druids, like the Jews, considered them unclean animals.

The very ancient superstition that a hare crossing your path is a sign of bad luck is frequently alluded to in literature. In the old play of the "Dumb Knight" by Lewis Machin (1680), written in conjunction with Gervase Markham, act iv, scene i, Alphonso says:

"Sure I met no spayfooted baker:
No hare did cross me, nor no bearded witch,
Nor other ominous sign."

Also in Ellison's "Trip to Benwell," lx:

“Nor did we meet with nimble feet
One little fearful lepus,
That certain sign, as some divine
Of fortune bad to keep us.”

Shakespeare constantly refers to the hare and speaks of it as melancholy and cowardly. The Romans ate hare, and Pliny says: “The flesh induces sleep and makes the eaters thereof beautiful.”

The practice of making toy hares and filling them with sweetmeats at Easter time, and of making ginger and other sweet cakes at that season in the form of hares is connected with a very old myth. The hare was originally a bird, according to Teutonic mythology, but was changed into a hare by the goddess Ostara. The animal acknowledges its former state at the feast of the goddess by laying eggs.

In Western Europe and Scandinavia the hare is regarded as the spirit of the corn. The last ears standing in the harvest-field are called “the hare,” and the man who cuts them has “caught the hare.”

In some places, says Mr. Millais, these ears are modelled into the form of a hare and treated with quaint ceremonies. Among the South American Indians “the Great Hare” is regarded as the creator of the universe, and they hold it in the same reverence as the North-American Indians do the beaver. There is an old Sanscrit fable which tells of the hare in the moon, the guardian of all earthly hares. The Hindoos see this sovereign hare in the moon, not a man as we do.

“If a hare makes an unexpected escape from the hounds,” says Sir Roger de Coverley, “the huntsman

curses Moll White, a reputed witch. I have known the master of the pack upon such an occasion send one of his servants to see if Moll White had been out that morning." The swiftness and cunning in doubling of the hare connected her with witches, and if one was shot it was always thought that some old crone would be found injured.

The "March Hare," who, with the "Mad Hatter" and Alice, were the guests at the Mad Tea Party in "Alice in Wonderland," has been a well-known and much cherished personality in every nursery for the last thirty years. He is represented in the well-known illustrations by John Tenniel with a wisp of corn round his ears. As a nursery favourite the "March Hare" has quite superseded Tiney, Puss and Bess, the tame hares of Cowper.

The poet found his pets difficult to tame, and his experience is confirmed by Mr. Drane and others who have kept hares in captivity. Cowper wrote of one of his hares :

"The surliest of his kind,
Who nursed with tender care,
And to domestic bounds confined,
Was still a wild Jack Hare."

But having once gained their trust and affection Mr. Drane speaks of them as pacific, trustful and affectionate in disposition to a most touching degree.

Although the hare is considered less courageous than the rabbit, for it has never been seen to turn on its enemies as a rabbit will at times, yet a hare will box, bite, and scratch a human being during the process of taming. Mr. Millais records that two friends of

his who have kept both hares and rabbits in captivity say the hare is a gentleman and the rabbit is a cad. Hare skins are used in the manufacture of felt, while a large number of skins of the mountain hare come over from Siberia and are used in the manufacture of various furs.

The hare is coursed with greyhounds, shot and hunted with harriers.

Martial has provided an excellent motto for hare hunters, as he speaks of it as "*Inter quadrupedes gloria prima lepus.*"

THE GUINEA-PIG.

Of all the foreign rodents with which we are familiar the guinea-pig is the best known. It has been kept as a domestic pet so long in this country that many fancy breeds have become established. The name of this animal is curiously inappropriate, since it is neither a pig nor does it come from Guinea. The original stock from which the domesticated breeds are derived is the restless cavy of South America, and the name is a corruption probably of Guiana pig. Like the rest of the cavies our guinea-pig has five toes on the fore and hind feet.

Other rodents which are more or less familiar through reading of them in books and seeing them in menageries are—the prairie dogs or prairie marmots of North America and the alpine marmot; the flying squirrels of Asia; the little squirrel-like chinchilla from the heights of the Andes, and the porcupine.

CHAPTER VII

BATS. CHIROPTERA

BATS are the only mammals that really fly. The arm and hand are specially modified for the purpose, the fingers being connected by a very delicate skin, which is extended from the fore limb along the side of the body to the hind limb, and in some cases it includes the tail. This membranous skin forms the wing or flying organ of the bats, and it is worked both by the arms and legs. Thus the wing of the bat is a very different structure from the wing of a bird, and it should be carefully examined and compared with a bird's wing. So specialised has the power of flight become in bats that they have almost lost the power of walking, and can do no more than make a feeble attempt at a crawl. The thumb is short and is provided with a claw; the remaining four fingers are much elongated, the third and fourth being longer than the forearm. The knee is directed backwards, and several bats have a spur on the heels to support the membrane connecting the two hind limbs.

In all nocturnal or crepuscular animals there is developed either an abnormally keen and specialised

sense of sight like that of owls, or this sense is suppressed, and in its stead an extremely delicate sense of touch is developed. Bats possess a most highly specialised tactile sense located in the delicate wing membranes, and in some cases in the folds of skin around the outer ears and nose.

The Chiroptera or "wing-handed ones" for the most part inhabit the warmer regions of the globe, and are divided into two big groups, which accord more or less with the nature of their food and their size, viz. the "fruit-eating bats" and the "insectivorous bats."

The members of the first group, which is known technically as the sub-order Megachiroptera, or "great wing-handed ones," are of much greater size; while the smaller insectivorous bats are included in the sub-order Microchiroptera—"small wing-handed ones."

Fruit-eating bats are always to be seen at the Zoological Gardens, and frequently are found mounted in museums. They will be recognised by their great size, the body being often as big as that of a rat. They are also known as "flying foxes," their long muzzles and rusty-brown fur suggesting the face of a small fox. But this is merely a superficial resemblance; no bats have any connection with foxes beyond the fact that they are both mammals. Nor, indeed, are they connected with any other mammals. They are a perfectly distinct order, and no fossil forms have yet been found to bridge over the gap that separates the bats from every other mammalian order.

Fruit-bats are found only in the Old World, Australia, Madagascar, and India. The fact that these slow and rather clumsy-flying bats should occur both in Madagascar and India is advanced in favour of the view of a previous land connection between India and Madagascar.

British bats all belong to the second sub-order of "small wing-handed ones," which are chiefly insectivorous, though some foreign species are blood-sucking and some are fruit-eating.

Beddard, in his 'Mammalia,'* divides the small bats of the world into five families:

(1) Rhinolophidæ, or leaf-nosed bats.

(2) Nycteridæ.

(3) Vespertilionidæ.

(4) Emballonuridæ.

(5) Phyllostomatidæ, a genus of leaf-nosed bats confined to South America.

Of these five families only two are represented in Britain, namely, the Rhinolophidæ and the Vespertilionidæ.

The Rhinolophidæ are characterised by the presence of a number of leaf-like processes of skin on the muzzle.

Of this leaf-nosed family of bats we have only two representatives, viz. the greater horse-shoe bat and the lesser horse-shoe bat, so called because the nose-leaf in their case is horse-shoe shaped.

The greater horse-shoe bat (*Rhinolophus terrum equinum*) is recorded from several localities in the South of England, and on the Continent this bat is

* 'Camb. Nat. Hist.,' vol. x.

found in considerable numbers in caves. The length of its body is $2\frac{1}{3}$ inches, and of the tail $1\frac{1}{2}$ inches. It is reddish-brown in colour on the back and greyish-white underneath.

The greater horse-shoe bat flies late in the evening, and usually in the neighbourhood of trees.

The lesser horse-shoe bat (*R. hipposiderias*) is little more than half the length of its larger cousin, the head and body measuring $1\frac{1}{2}$ inches and the tail $1\frac{1}{8}$ inches. It has been seen only in the south of England and in Ireland. In County Clare the lesser horse-shoe bat was found hibernating in caves among plantations, and the two sexes occurred in separate colonies. The ears are pointed and shorter than the head, and spring from the forehead.

There are fifteen species of bats reported as British ; two of these are referred to above, and the remaining thirteen species all belong to the family Vespertilionidæ, which is the most numerous in species and most widely spread of all the families of bats.

The apertures of the nostrils are simple, round, or crescentic, and there is no leaf-like membrane round the nose in the members of this family. The ears take origin from the side of the head, and an earlet or tragus is present within the outer ear. The tail is either completely contained within the membrane joining the hind-legs or produced but slightly beyond it, and the second or index-finger has two joints.

Of the nine genera mentioned by Beddard four are represented in Britain, viz. *Vesperugo*, *Vesper-*

tilio, Plecotus, and Synotus. *Vesperugo* is by far the most numerous of all the genera. It contains seventy-five species all told, five of which inhabit this country. The common bat which flits about, as the sun sinks, is one of them. He is called the



FIG. 41.—The Pipistrelle (*Vesperugo pipistrellus*) at rest.
(Photo. from life by H. C. Wood.)

“Pipistrelle” (*Vesperugo pipistrellus*), and is the smallest of the British bats, the head and body measuring only $1\frac{2}{3}$ inches and the tail $1\frac{2}{5}$ inches. It is found in every part of the British Isles and all over Ireland.

It was for some time confounded with the mouse-



FIG. 42.—Pipistrelle (back view). (Photo. from life by H. C. Wood.)

coloured bat (*Vesperugo murinus*), the common bat of the Continent, until the error was corrected by the Rev. Leonard Jenyns.

The colour of the fur is reddish-brown, and the wing membranes spring from the bases of the toes and not from the ankles. In mild seasons it flies at night and early morning from March to November. Its food mainly consists of the night-flying Lepidoptera, flies and gnats, and when the supply of food ceases the animal hibernates in some crevice or corner of an old roof; sometimes in a chimney, or even in the hole of a tree. Many specimens have been obtained from the roofs of churches. On a mild day, even in winter, it will come out for short flights.

The pipistrelle is more active on the ground than many of the bats, and Bell has noticed that this and other bats use the tip of the tail to assist them in climbing, both in ascent and descent. He speaks of the tip of the tail as "the little caudal finger" which projects beyond the edge of the membrane joining the legs. The pipistrelle may be kept in captivity and fed on raw meat and flies, but care should be taken not to subject it to any glaring light.

Dr. N. H. Alcock, in the 'Irish Naturalist,' viii, 33, gives some very interesting notes on the hibernation of bats. He says:

"When one of these animals intends to hibernate the following phenomena are observed. The animal retires to a secluded spot, hangs itself up, and gradually becomes motionless. Its temperature falls

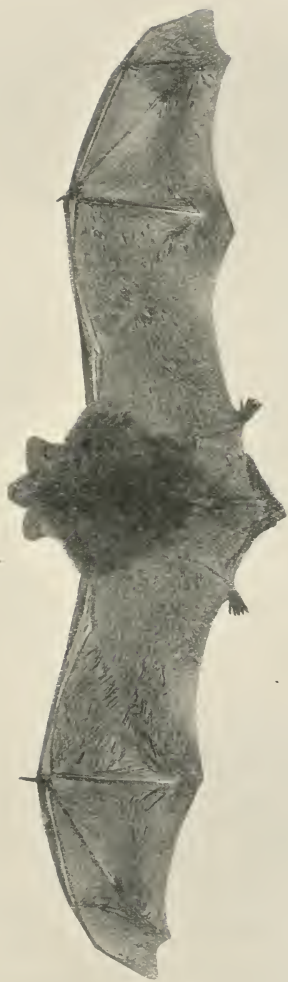


FIG. 43.—The Pipistrelle (under surface). (Photo. from life by H. C. Wood.)

to within a few degrees of the surrounding air, and its breathing becomes shallow and irregular. If accurate measurements are taken it is noticed that much more oxygen is absorbed than is accounted for by the CO_2 given out, so that the animal actually gains in weight. The heart beats more slowly and less forcibly, and the activity of the nervous system is much reduced. On awakening from this condition in the spring these phenomena are reversed. The animal's temperature rises sometimes as much as three degrees in fifteen minutes. The muscles shudder convulsively, the heart beats more strongly, and the skin, before pale, assumes a rosy blush. Respiration becomes more rapid, and there is a great discharge of CO_2 from the lungs."

Dr. Alcock adds that "bats store their food internally, and occasionally wake up and eat," by which, we suppose, he means absorb or assimilate the stored food. The other members of the genus *Vesperugo*, best known to us, are the serotine, the noctule or great bat, and the hairy-armed bat.

The serotine (*Vesperugo serotinus*), although a widely distributed bat ranging from the New World to the Old, is rare and local in this country. It has been taken near London and at Folkestone and the Isle of Wight. The head and body together measure $2\frac{3}{4}$ inches and the tail 2 inches. The fur is smoky brown above and yellowish-white beneath. It has a slow fluttering flight and only comes out late in the evening.

The noctule or great bat (*Vesperugo noctula*)

measures, head and body together, 3 inches, and tail 2 inches. The habits of this bat were first described by Gilbert White, Letter XLVI, who gave it the name of "alti volans" from its high flight. The colour of the fur is pale yellowish-brown, though in some specimens it is chestnut as described by Gilbert White. The noctule is found only in the southern counties of England, and is unknown in Wales, Scotland and Ireland. Its food consists of cockchafers and large beetles and its resting-place is usually a hollow tree. They may be traced, as White observed, by their very offensive smell. When at rest the tail is bent upwards between the legs.

The hairy-armed bat (*Vesperugo leisteri*) looks like a small noctule. The head and body measure $2\frac{1}{4}$ inches and the tail $1\frac{2}{3}$ inches. Like the noctule it has a band of fine short hair running down the underside of the forearm from the elbow to the wrist, but the real distinction between it and the great bat lies in the teeth, and its smaller size. It is rare, but has been taken in the west of England, the Lake district and Ireland.

The long-eared bat is the only British representative of the genus *Plecotus*. The ears are enormous, being nearly as long as the head and body. The general colour is brown above and whitish beneath. The length of the head and body is $1\frac{3}{4}$ inches and the tail about the same. This species is almost as common in the British Isles as the pipistrelle. It has a very swift and active flight, preferring the open country to the neighbourhood of trees. When

in repose it hangs from the walls of some old building, suspended by its hind feet, folds back the outer ears along the sides of the head and body and erects the tragus or inner ear. The wing membranes are neatly folded and it draws up the tail. When about to fly it erects the head and ears and raises the



FIG. 44.—The Long-eared Bat (*Plecotus auritus* [Linn.]).
(Photo. by H. C. Wood, from a specimen in the British Museum of Natural History.)

hands. It is active on the ground, using its tail and claws. It utters a sharp, very shrill cry, which is so highly pitched as to be inaudible to many human ears.

The barbastelle is a little black bat, the head and body measuring $1\frac{3}{4}$ inches and the tail about the same. This bat is very like the long-eared bat, but

has smaller ears. It has been found in several counties in England and in summer has been seen as far north as Carlisle. From this and other records observers consider that some bats are occasionally summer migrants.

The genus *Vespertilio*, which has six British representatives, may be distinguished by the thin and narrow ears which its members possess, also by the thin and hairy muzzle. The nostrils are simple and the aperture is crescentic.

Although specialists have of late given more attention to English bats, there is very little common knowledge of them. Most people are uncertain whether they be mouse, bird or reptile, and prejudice, which has proclaimed them unlucky and uncanny, still prevails, and prevents the greater number of us from realising the beauty and great interest which are attached to these little animals—the only flying mammals.

Thrilling travellers' tales have been told of the blood-sucking vampires of South America, but they were much exaggerated, and the innocent suffered long for the guilty. *Vampyrus spectrum* is figured in old books as the creature who sat upon the toes of the unwary sleeper, cunningly fanning them softly with his wings and thus luring their owner, in the heat of a tropical night, into deeper slumber, that the gruesome visitor might enjoy undisturbed his feast of blood. But *Vampyrus spectrum*, though of terrifying aspect, is not a blood-sucker at all. The real blood-suckers belong to the genera *Dermodus* and *Diphylla*. *Dermodus rufus* is the best known of these. He has

a pipe-like gullet suitable only for swallowing liquid food and no true stomach.

There is also a blood-sucking bat in India known as the Indian vampire (*Megaderma lyra*), but his principal victims are frogs.

In strange contrast with the usual sombre colouring of bats there is a genus of bats in Ceylon which are highly coloured. These coloured bats belong to the family Vespertilionidæ, and are therefore distant cousins of some of our British bats. Of these *Kerivoula picta* is the best known, and so gay is its colouring that it has been likened to a huge butterfly.

CHAPTER VIII

THE UNGULATES, OR HOOFED ANIMALS.

THE animals belonging to this group are for the most part of considerable size, and the family includes our most useful domestic animals, as the horse, cow, sheep, goat and pig. Many fossil forms now extinct have been found, which throw light on the various modifications of the bones of the limbs which occur in this family. The earlier forms were plantigrade,* but the more recent forms walk on their toes. The toes end in hoofs rather than claws or nails. The reduction of toes culminates in the one-toed horse; at the same time the ulna becomes vestigial and fuses with the radius, and the fibula in the hind limb undergoes a similar reduction, forming single bones called cannon bones. There is no collar-bone, and the teeth have broad, flattened crowns adapted to chewing vegetable food.

There are large chisel-shaped incisors, but these may fall out, or be totally absent in the upper jaw (cow, deer and sheep). Between the incisors and pre-molars there is always a gap. The canines are often absent, or only present in the upper jaw of

* Plantigrade—walking on the soles of the feet, from *L. planta*—sole, and *gradus*—going, walking.

males, and may be transformed into tusks. The molars are traversed by folds of enamel with short tubercles and ridges which generally run transverse to the long axis of the jaw. The ridges and tubercles are worn down by use to an even masticating surface, and a complicated pattern is thus frequently produced on the crown of the tooth, taking the form of four crescents.

The Ungulates are the only mammals which possess horns. These weapons take the place of the teeth and claws of the Carnivora, but they are usually present in the males only, except in the case of the reindeer, cows and some sheep and antelopes. Horns vary in structure. The horn of the rhinoceros is merely a collection of matted hair borne upon a boss of bone. The horns of the giraffe are, for all practical purposes, identical in structure with those of the deer tribe. They are masses of bone, at first separate from the skull, but afterwards become fused with it, and they are covered with skin. The horns of the deer tribe consist of the same bony core, pedicle or "os cornu," covered, as the giraffe's horns are, with skin, which is known as "velvet." This vascular skin is only present while the horns are growing, and is rubbed off by the animal as he uses his horns or antlers, when they are full grown. In the stag, the horns or antlers consist only of the bony core, which is not, as in the case of the giraffe, permanent; but is shed annually or every few years. During the process of rubbing off the "velvet" the horns present a gory and sore appearance, showing that the skin or "velvet"

was living and full of blood-vessels. Stags in this condition may be seen at the Zoological Gardens during the summer months. Besides casting the "velvet" deer also shed periodically the bony part of the horn. The horns of ruminants, *i. e.* oxen, goats and antelopes, are composed of a bony core with a horny covering. These horns are never shed except in the case of the American Pronghorn Antelope or Prongbuck, which sheds its branched or pronged horn periodically as the stag does its "velvet."

There is a long series of fossil Ungulates, exhibiting, as we pass from the more ancient fossil types to the modern ones, a gradual evolution towards the perfection of the limbs as running organs.

The existing members of the order form four groups :

(1) Hyracoidea, represented by that survival of antiquity the hyrax, rock-badger or "dassie" of Africa, which exhibits certain features connecting it with the rodents, especially in the persistent growth and form of the incisor teeth. The Syrian form (*Procavia Syriaca*) is the "coney" of the Bible.

(2) Proboscidea, or elephants.

The remaining forms, among which are the more familiar animals, are divided into two groups, distinguished by the structure of the foot. One of these is—

(3) Artiodactyla,* the even-toed Ungulates, represented by the oxen, sheep and goats, etc., and the other is—

* Fr. Gr. *artios*—even in number, and *daktylos*—a finger or digit.

(4) *Perissodactyla*,* or odd-toed Ungulates, represented by the horse, tapir and rhinoceros.

In the odd-toed Ungulates the axis of the foot passes through the third digit, or what is commonly known as the second finger. In the horse, all the other digits have disappeared, and this digit alone forms the foot. In the rhinoceros the second and fourth digits remain on either side of the median third digit.

In the even-toed Ungulates the third and fourth toes are often the only digits present. They are larger than the second and fifth and are symmetrical to a vertical line drawn between them, and form the well-known "cloven hoof." Curiously enough, the number of horns corresponds with the number of toes, the even-toed Ungulates having paired horns and the odd-toed having single horns. And as Mr. F. E. Beddard quaintly says,† in speaking of the fossil odd-toed Ungulates, "they have more than once tried, so to speak, paired horns, which ultimately proved fatal to them." Thus the representation of the fabled unicorn as a kind of horse was so far correct.

ELEPHANTS (PROBOSCIDEA).

Elephants are the largest among existing land animals, and possess a strangely elongated organ known as the trunk, which consists of the nostrils and upper lip drawn out to a considerable length.

* Fr. Gr. *perissos*—uneven, odd, and *daktylos*—digit.

† 'Camb. Nat. Hist.,' vol. x.

They are vegetable feeders, living in the mountainous forests of India and in Central and South Africa.

The legs of the elephant are like pillars, the femur and humerus not being bent respectively on the lower leg and forearm. In this absence of angulation at the joints the elephant is unique. When it kneels the forearm and lower part of the leg are bent in the same direction. These powerful pillar-like legs enable the elephant to support its massive body, which often weighs several tons, and to carry on its back burdens amounting to three tons in weight.

The skin is hard and very tough and almost bare of hair, but there is a tuft of hair on the end of the tail. The skull is enormous compared with the size of the brain. The large air-cavities in the skull add to its strength and enable the animal to use its head as a battering-ram without injury. They possess two tusks, which are the enlarged incisors of the upper jaw. The molars are so large, often measuring 16 inches by 4 inches, that there are never more than three, usually only two, above the gum at the same time. At first there is only one grinder on each side in each jaw, then a second grows up behind it; later the front one drops out, and a third develops behind the second. Each tooth, as it appears, is larger and has more ridges than the earlier ones. The Indian elephant has more ridges in its teeth than the African species; as many as twenty-seven ridges being developed in the grinders of the former, while in the molars of the latter there are never more than ten or eleven ridges.

The stomach is simple, and no elephant has a gall-bladder or a collar-bone.

There are five toes on each foot, but the toes are not all provided with nails.

Clever as elephants are, Mr. F. E. Beddard says their brains suggest a high specialisation of a low type. The cerebral hemispheres are much convoluted, but they are so small as to leave the cerebellum completely uncovered.

The Indian elephant, though smaller than the African, is a much more shapely looking beast. The front legs are longer than the hind ones, but are not so long, in proportion, as those of its African relative. The forehead does not slope back so much, and the two bosses on it give the animal a very intelligent countenance. The trunk has only one projection or "finger" above and between the nostrils, while the trunk of the African elephant has a triangular projection on both the upper and lower surfaces of the orifice. There are five nails on the fore foot and four on the hind foot, and the ear is much smaller than that of the other species.

It is the Indian elephant who is the great beast of burden and servant of man, and it is of him that most of the legends and stories of elephant sagacity are told. Individual elephants vary so much in disposition, some being most docile and tractable and ready to give their service, while others are treacherous and unsafe.

The African elephant is larger and clumsier, and has very large ears and a much less intelligent

countenance than its Indian cousin. But was not "Jumbo" a native of Africa? And we all know how large and clever and docile he was. He stood 11 ft. at the shoulder and weighed 5 tons. As a rule, the African elephants are wild and untameable, but "Jumbo" was an exception.

Elephants were used in battle by Eastern peoples, and Pyrrhus brought them to Europe B.C. 280 to fight against the Romans.

It would seem that Sir Ray Lankester* has solved the problem as to whether the Carthagenians used the African or the Indian species, from the evidence of a Carthaginian coin, on which is represented an elephant with very large ears and a sloping forehead—distinctly the African type.

The first elephant brought to England was given by the King of France to Henry III in 1257, and was kept in the Tower.

Aristotle put the length of an elephant's life at 200 years, a statement which modern zoologists think is not far from correct. But in spite of their longevity, elephants, as a race, are dying out. Only two species survive of the many elephants, that we know from their fossil remains, must have existed in past times. Thus, though men have regarded the elephant as the emblem of eternity, his is a structure which is not destined to survive.

The tusks are frequently used for digging up roots for food, one often being a more favourite tool than the other, as men use the right hand more than the left. The tusk thus used is shortened

* 'Science from an Easy Chair,' second series, p. 134, Adlard & Son.

by wear, and on an average would weigh about 65 lb., while the one less used would weigh 75 lb. "The stride of the elephant is about 8 ft., and his pace at the first rush," says Sir Samuel Baker,* "is fifteen miles per hour, which drops in the space of two or three hundred yards to ten miles per hour, which rate of progress can be kept up for long distances."

The Indian and African elephants are the sole survivors of a great variety of elephants, which have formerly existed in immense numbers all over the world, except in Australia. They varied in size from a small animal about the size of a donkey to the stature of the living African species. Of these the best known is the mammoth (*Elephas primigenius*), an elephant of the Indian type, which had a very wide distribution all over Europe, Northern Asia and North America, being abundant in Europe, especially in Russia and Siberia, and it continued to exist, at least in Siberia, almost up to the historic period, where whole herds of them appear to have been engulfed, as by a swamp from which they could not extricate themselves.

Two specimens in remarkable preservation have been discovered, one at the mouth of the Lena in 1806, now in the Imperial Academy of Sciences at St. Petersburg, and another which was very carefully dug out by Dr. Hertz in 1902 at Yakutsh. This animal was so perfectly preserved that it was possible to state the cause of its death. A large amount of clotted blood was found in the chest

* 'Wild Beasts and their Ways.'

cavity, which indicated the bursting of a blood vessel, due to over-exertion in its efforts to extricate itself from the hole into which it had evidently tumbled. When discovered, the animal still had the mouthful of grass between its teeth which it must have bitten off many thousands of years ago.

From these and other well-preserved specimens we know that the mammoth had a reddish-brown woolly coat with long black hair, and a large tassel of hair at the tip of the tail. In the Natural History Museum may be seen a piece of this woolly skin and some of the black hair, which specimens cannot fail to appeal to the imagination. Mammoths were no larger than the living Indian elephant, although their tusks were much longer, stouter and heavier, and instead of being extended directly forward from the mouth, were curved outwards, forming a bow, the ends curling backwards and almost meeting. These tusks are found in the Arctic regions in such large numbers, and so well preserved, that they have been articles of commerce for at least two centuries, and this source of ivory was known long before to the Chinese.

There is no doubt man knew the mammoth, as he has left drawings of the animal scratched on mammoth ivory, and excellent drawings of mammoths have been found in the caves of Cambarelles in France. It has been suggested, too, that the memory of elephants has been traced in architecture. Mr. Watkins, in his 'National History of the Ancients,' speaks of an elephant's head on a pillar in the church of Ottery St. Mary and again in

Gorberton Church, Lincolnshire. Whether this is a traditional memory of elephants, or whether the elephant is here used, as the ancients used it, as a symbol of eternity, is difficult to say. The trunk of the elephant in the above figure is spiral.

Mr. Watkins derives the word "mammoth" from Behemoth. The Behemoth of Job "eateth grass as an ox . . . He moveth his tail like a cedar." "Behold he drinketh up a river and hasteth not." All this sounds very much like the habits of the elephant, but Mr. Millais considers "mammoth" to be a corruption of the Siberian word "Mamantu," which means "ground-dweller," since the people of that country regarded it as a huge subterranean mole.

The figure of an African elephant is found on some Carthaginian coins, as an emblem of eternity, and the same idea is expressed in the East by the figure of the Indian elephant resting on a gigantic tortoise, supporting the world. On a medal of the Emperor Philip we find engraved an elephant with a child on his back carrying arrows. It is possible this figure may represent the idea of the eternity of love.

The "cornes de lecorne," given by Haroun al Raschid to King Charlemagne, are considered to have been mammoth tusks.

Kipling, in the 'Jungle Book,' gives one of the most vivid pictures of elephant character. The story tells how the great elephant, Kala Nag, carried his small mahout, Taomai, unhurt, not only to the great elephant drive or capture of elephants, but to the

scene of the mysterious elephant dance, which no human had ever before witnessed.

The proverbial white elephant, though "very strange and rare," seems to have existed in India. In Hakluyt's 'Voyages,' vol. v, p. 487,* Ralph Fitch writes of his voyage to Goa in the East Indies (1583-91). He describes his visit to the King of Pegu, and amongst the many marvellous possessions of this king were :

"Foure white elephants, which are very strange and rare; for there is none other King which hath them but he: if any other King hath one' hee will send unto him for it. When any of these white elephants is brought unto the King, all the merchants in the City are commanded to see them, and to give him a present of halfe a ducat, which come to a great summe: for that there are many merchants in the City. After that you have given your present you may come and see them at your pleasure, although they stand in the King's house. This King in his title is called 'The King of the White Elephants.' If any other King have one, and will not send it to him, he will make war with him for it: for he had rather lose a great part of his Kingdom, than not to conquere him. They do very great service unto these white elephants; every one of them standeth in an house gilded with golde, and they doe feede in vessels of silver and gilt. One of them when he doth go to the river to be washed, as every day they do, goeth under a canopy of cloth of golde, or of silk carried over him by sixe or eight men, and eight or ten men

* Published by James MacLehose & Sons, Glasgow, 1904.

go before him playing on drummes, shawmes or other instruments: and when he is washed and commeth out of the river, there is a gentleman which doth wash his feet in a silver basin! which is his office given him by the King. There is no such account made of any blacke elephant be he never so great. And surely there be wonderful faire and great, and some be nine cubites in height. And they do report that the King hath about five thousand elephants of warre, besides many other which be not taught to fight.”

CHAPTER IX

EVEN-TOED UNGULATES (ARTIODACTYLA)

THE fourth sub-order of Ungulates includes such familiar creatures as the hippopotamus, pig, camel, deer, giraffe, oxen, and sheep, etc. They all have an even number of toes, and their feet are symmetrical to a line drawn between the two median toes, representing the third and fourth digits. They are divided into two groups :

(a) the Suina

(b) the Ruminantia.

The Suina include the hippopotamus and the pigs. The hippopotamus has four toes touching the ground, the second, third, fourth, and fifth digits, while the pig has all these four digits, but only two of them, the third and fourth, touch the ground, and this type of foot is known as a cloven hoof. Pigs are exceptional among the common Ungulates, in that their metacarpals and metatarsals do not unite to form cannon bones.

The hippopotamus is now strictly confined to Africa, but until recently it must have lived in Madagascar. It is a thick-skinned beast frequenting rivers, and, like other aquatic animals, its nostrils

are on the surface of the head, and their owner can close or open them at will, which enables him to remain some time under water. It grows to a length of about 14 feet, and is of enormous strength, capable of capsizing boats. He is an expert swimmer, and can also walk rapidly along the bottom of the river. The hippopotamus is subject to a "bloody sweat." A red fluid containing crystals and corpuscles is exuded from his skin, but though having a similar appearance, the fluid has really nothing to do with the blood (Beddard).

The remains of the hippopotamus are found in considerable numbers in the Thames Valley and as far north as Yorkshire, showing that he inhabited this country probably in the warm interval between the two ice ages.

Pigs.

Once the most common amongst our domestic animals, the pig, is now fast becoming quite scarce owing to the restrictions placed upon those who would keep them, by the sanitary and agricultural authorities. Thus, the careless and slothful and ignorant are driving out of existence an animal, which has been domesticated in England for more than a thousand years. But a few years ago every householder and many cottagers cured their hams and bacon for the winter; now bacon is so dear as to be regarded a luxury. Any place, any food was considered good enough for a pig, but, like all other animals, he thrives best when living on good food and in cleanly surroundings. His

native home is the swampy underwood of the forest, and he likes to roll in the mud, and then rub it off in the underwood, using the mud and underwood in place of soap and towel, and by no means because he likes dirt and filth, which are commonly supposed to be his favourite accompaniments. No



FIG. 45.—The Pig. (Photo. from life by H. C. Wood.)

domestic animal responds more to care and cleanliness, and there is not one that repays us better for our trouble. Do let us try to treat him with more energy and intelligence, or we shall lose him altogether.

There is something very attractive and smart about the curves and lines of a well-grown and well-

cared-for pig. They compose and harmonise in spite of his heavy body, and his shapely feet and crisply curling tail show that he takes some pride in his appearance.

The pig is a very old inhabitant of the forest

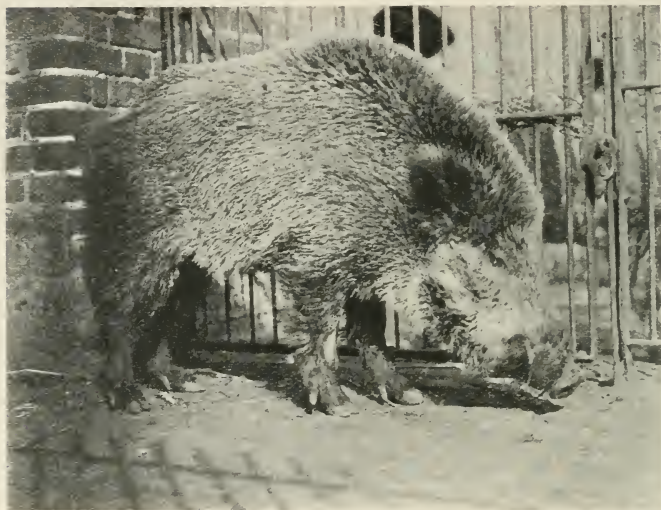


FIG. 46.—The Wild Boar. (Photo. from life by W. S. Berridge.)

swamps of Britain, as his fossil bones, dating back to the Pleistocene period, tell us, and it is from these wild boars that the domestic race of pigs is descended. The Saxons kept their herds of tame swine, and they also hunted the wild ones. There are frequent allusions to the Saxon swineherd, and Strutt, in his 'Sports and Pastimes,' gives a repro-

duction of a manuscriptal painting of the ninth century in the Cotton Library, which represents a Saxon chieftain with his huntsman hunting wild boars with spears and a couple of dogs, and also a copy of a drawing, dating back to the beginning of the fourteenth century, depicting a man spearing a boar, in which the boar would appear to run conveniently on to the spear.

Strutt* tells us of the earliest treatises on hunting ; the oldest of them known to him was originally written in French by William Twici, or Twety, grand huntsman to King Edward II. This work was called ‘*Art de Venerie lequel Maistre Guillaume Twici venour le Roy dangleterre fist en son temps per aprendre Autres.*’ The English version of this tract is said to be by Twety and John Gyfford, “maisters of the game to King Edward.” A second early work on hunting, called ‘*The Maister of the Game,*’ was written by the master of the game to Henry IV for the use of Prince Henry, his son. It is but an enlargement of Twici’s work. ‘*The Book of St. Albans,*’ so called because it was printed there about 1481, is the first printed work on hunting. It is compiled from the two manuscripts above mentioned, and is said to have been the work of Juliana Barnes, or Berners, the sister of Lord Berners, prioress of the nunnery of Sopewell.

Twici, in a poetical prologue,† gives the names of the animals suitable for sport, and divides them into three classes :

* *Loc. cit.*, p. 17.

† See Warton’s ‘*Hist. Eng. Poetry,*’ vol. ii, p. 221.

(1) The beasts for hunting—the hare, the hart, the wolf, and the wild boar.

(2) Beasts of the chase—the buck, the doe, the fox, the marten, and the roe.

‘The Book of St. Albans’ here adds that all other kinds of beasts subject to hunting are to be called “Raskall,” derived from an old French term of the chase, meaning the common herd, the scum or scrapings of the beasts.

(3) We find three animals in the third class, which are said to afford “greate dysporte” in the pursuit, and they are denominated the grey or badger, the wild cat, and the otter.

Strutt says that most of the authorities agree about the animals to be placed in the first class, but the beasts placed in the second and third classes vary considerably.

By some the beasts of the chase are divided into two classes :

(1) Those of sweet flight—the buck, the doe, the bear, the reindeer, the elk, the espytard (hart said to be 100 years old).

(2) Those of stinking flight—the fulimart, the fitchat, or fitch, the cat, the grey, the fox, the weasel, the marten, the squirrel, the white rat, the otter, the stoat, and the pole-cat.

And thus we see that the boar was of first class rank as a beast of sport and no “raskall.” Manwood, in his ‘Forest Laws,’ tells us that he was hunted from the Nativity to the Purification of Our Lady, *i. e.* from Christmas to Candlemas.

Those who would hunt the wild boar needed

courage, dexterity, and bodily strength, for he is a formidable animal when brought to bay, and will assuredly, with one stroke of his powerful tusks, rip up a dog, or tear open a horse's flank, and a skilful use of the boar spear is needed to protect the huntsman. Indeed, killing a wild boar in the Middle Ages was accounted an act of chivalry. William of Malmesbury * tells us that in the time of Edward the Confessor a very savage wild boar haunted the forest of Bernwood in Buckinghamshire. This boar was eventually killed by Nigel, the King's huntsman, who gave the head to his master. Edward the Confessor rewarded Nigel for his prowess with a gift of a hyde of arable land called Deerhyde, a wood called Halewood, and the custody of Bernwood, and as his charter he gave him a huntsman's horn.

There is also a remarkable monument in Penrith churchyard, which is said to have been erected to Sir Owen Cæsarius in recognition of his having killed many savage wild boars in Inglewood Forest.

Hunting the wild boar was the sport of kings; Henry I, Edward III (whose badge was a wild boar), and Henry VIII especially delighted in it. It is difficult to ascertain the exact date at which wild swine became extinct in England, as a sownder† of them was always kept until recently in an enclosure in Windsor Great Park.

The sport is still pursued in France and in Germany. An interesting account of a wild boar hunt in France was given in 'Country Life,' March 10th,

* 'Archæologia,' vol. i, p. 195.

† "Sownder" is the technical term for a company of wild swine.

1906, but the best account of hunting the "wyld bore," as practised in England in the fourteenth century, is to be found in the 'Booke of Hunting,' 1575, by George Turberville, a squire of Dorsetshire. Fitzstephen, in his 'Description of London,' written in the reign of Henry II, about 1174, speaks of the wild boar as an inhabitant of the great forest around London, and describing the sports and pastimes of the citizens he says* :

"In the holydays all the summer the youths are exercised in leaping, dancing, shooting, wrestling, casting the stone, and practising their shields. The maidens trip with their timbrels and dance as long as they can well see. In winter, every holyday before dinner, the boars prepared for brawn are set to fight, or else bulls or bears are baited."

In "Elizabethan England"† we are told :

"As for swine, there is no place that hath greater store, nor more wholesome in eating, than are these here in England, which nevertheless do never any good till they come to the table. Of our tame boars we make brawn, which is a kind of meat not usually known to strangers (as I take it), otherwise would not the swart Rutters and French cooks, at the loss of Calais (where they found great store of this provision almost in every house), have attempted with ridiculous success to roast, bake, broil, and fry the same for their masters till they were better informed. I have heard, moreover,

* Stowe's 'Survey of London,' Bk. I, p. 247.

† "Elizabethan England," from a description of England by William Harrison (in Holinshead's 'Chronicles,' 1586, Camelot Series, pp. 157-8).

how a nobleman of England not long since did send over a hogshead of brawn ready soured to a Catholic gentleman of France, who, supposing it to be fish, reserved it till Lent, at which time he did eat thereof with great frugality. . . . With us it is accounted a great piece of service at the table from November until February be ended, but chiefly in the Christmas time. With the same also we begin our dinners each day after other."

Then follows a description of the method of preparing the brawn.

Boar's head was a famous old English Christmas dish, and the custom of serving it in the ancient fashion is still retained at Queen's College, Oxford, where it is carried up to the principal table in the hall with great state and solemnity during the singing of a carol. Hearne, in his 'Remarks and Collections,'* gives—

"The song called "The Boar's Head," sung every year on Christmas Day, and three or four days before, by the Taberders of Queen's College according to the ancient Custome."

"The Boar's Head in hand bear I
Bedeck't with Bayes and Rosemary;
And I pray you my Masters merry be
Quot estis in convivio.

Caput apri defero
Reddens laudes domino.

"The Boar's Head as I understand
Is ye bravest dish in all ye Laud
Being thus bedeck't with a Gay Garland
Let us servire cantico.

Caput apri, etc.

* 'Oxford Historical Society,' vol. ii, 1707-10, p. 101.

“Our Steward has provided this
 In honour of the King of Bliss
 Which on this day to be served is
 In Reginensis Atrio.
 Caput apri, etc.”

There are many versions of this carol, one of which was included in a set of carols* printed by Wynkin de Worde in 1521, and another very curious version is included in the Porkington Manuscript of the 15th century.

The national dish was often used as an inn sign. Shakespeare frequented the Boar's Head tavern, which stood in East Cheap, where the statue of William IV now stands.

The various uses of the pig—and they are many—are quaintly given by Topsell in his ‘History of Four-footed Beasts.’† He says—

“Only I cannot contain myself from the fiction of a Swine's name and testament, or last will, for the mirth and wit thereof, as it is remembered in Coelius, and before in S. Jerom, and lastly by Alexander Brassicanus, and Geo. Fabritius, I will express both in Latine and English in this place. . . . In English without offence I may translate it thus : I, M. Grunter Hogson little Pig have made this my last Will and Testament, which because I could not write with my own hand I have caused it to be endited by other. Magirus the Cook said unto me, come hither thou underminer of houses, thou rooter

* See Warton's ‘History of English Poetry.’

† ‘The History of Four-footed Beasts,’ by Edward Topsell, 1658, p. 513.

up of land, fearful, fugitive little Pig, I must this day take away thy life. To whom Hogson made this answer : If I have done any harm, if I have offended, if I have trod in pieces any vessels of worth under my feet, then I intreat thee good M. Cook pardon me and grant me my request. But Magirus the Cook said : Run (Sir Kitchin-boy) and bring me a knife out of the Kitchin, that I may let this little Pig bleed : presently I the little Pig was taken by the servants and by them led the XVI day of the Calends of Torch-light into the place of Cool-worts, when Fiery-furnace and Pepper-spice were Consuls, and when I saw no remedy, but that I must die, I entreated the Cook but an hour's space to make my Will. Which when I had obtained, I call'd my Parents and Friends about me, and made my Will in manner following : Of all my meat and provision left behinde me, first I give unto Bore-brown my father 30 bushels of Buck-mast. Item I give to my mother Town-sow, 40 bushels of the best wheat. Item I give to my sister Whine-pig 30 bushels of Barly, and for my bowels I bestow them in manner following : I bequeath my bristles to the Coblers and Shoomakers, my brains to Wranglers, my ears to the deaf, my tongue to Lawyers and Pratlers, my intrails to the Tripe-makers, my thighes to the Pye-makers, my loins to women, my bladder to boys, my tail to young maids, my muscles to shameless Dancers, my ankle-bones to Lackyes and Hunters, my hoofs to Thieves. Item I give unto this (unworthy to be named) Cook the Knife and the Pestle, that I brought out of the spinny of an oak, into

my stye, and so let him tie his neck with a halter. Also my Will is, that there be made for me a monument, wherein shall be ingraven in Golden Letters this inscription or title, M. Grunter Hog-son, Little-Pig, lived nine hundred ninty-nine years and a half, and if he had lived but one half year longer, he had lived a thousand years. And you my Lovers and best Counsellors of my life, I beseech you do good to my dead carkase, salt it well with the best season of Nutmegs, Pepper and Hony, that so my name and memory may remain for evermore. And you my Masters and kindred which have been present at the making of my Will, I pray you cause your marks to be put thereunto.

“Witnesses :

“Woodhog’s mark, Bristle-back’s mark,
Town boar’s mark, Mountain hog’s mark,
Bacon hog’s mark, Swill hog’s mark, Marsh
hog’s mark.”

In addition to the uses of the various parts of a pig’s body recorded here, the same author tells us that the skin was made into “Shoo-leather, but now by reason of the tenderness and looseness thereof, they use it not, but leave it to the Sadlers, and to them that cover Books, for which cause it is much better than either Sheep or Goats’ skins, for it hath a deeper grain, and doth not so easily fall off.”*

Most of us are familiar with the sad accident, described by Charles Lamb, which befel the litter of pigs in charge of Bobo, the lubberly son of the swineherd Hoti. It is to this accident, so Mr. Lamb

* *Loc. cit.*, p. 521.

says,* that we owe the discovery of the art of roasting, which formed the foundation of the great art of cookery.

We can see the European wild boar (*Sus scrofa*) in the Zoological Gardens, which was once so abundant in the forests of England, Scotland and Ireland, and played so great a part, both alive and dead, in the social life of the people. The wild animal is longer on the leg and much more hairy than the domestic pig. The snout is longer and more mobile, and the ears are shorter. His wedge-shaped head enabled him to push his way rapidly through the tangled underwood; his thick and bristly skin protected him from injury, and his divided hoofs enabled him to walk through swamps without sinking. The eyes are small deep-set, and surrounded by bristles. His four canine teeth, developed into powerful tusks, all pointing upwards, made him formidable to his enemies. He was an omnivorous feeder on fruit, nuts, insects and their larvæ, snails and mice. In the autumn he would make for the fields or vineyards, at night, and smelling out the turnips or potatoes with his keen nose, he would dig them up with his powerful snout. And what a wonderful burrowing instrument the snout of a pig is. Look at it again, if you have a chance. Most writers say he is no good till he is dead, but though he often wrought sad havoc, he sometimes did good by trampling down the ground, and he destroyed a large number of insect larvæ. The pig's keen sense of smell has been made use of in training the

* 'Essays of Elia,' "A Dissertation upon Roast Pig."

animal to find truffles. Looking at our pig in his sty, can we see in him this brave and ferocious denizen of the forest swamps, this menace to the countryside, the slaying of which was accounted a deed of chivalry?

RUMINANTS.

All these animals swallow their food rapidly, but it is again forced back up the gullet and more thoroughly masticated—a process which is known as chewing the cud. The stomachs of ruminants are divided into several compartments varying in structure. Sometimes there are three, but more usually four divisions. There is never more than one pair of incisors in the upper jaw, but more often there are none at all, as in oxen and sheep.

Ruminants are divided into three groups, the Chevrotains, the Tylopoda or camels, and the Pecora or deer, oxen, sheep, etc.

PECORA OR DEER, OXEN, SHEEP, &c.

The chief characteristic of the Pecora, or group which includes the deer and oxen, is the possession of horns. They have two functional digits on the feet, and the metatarsals and metacarpals unite to form cannon bones. There are no incisors in the upper jaw, and canines, though sometimes present, are rare. The stomach is divided into four compartments. The food when first swallowed passes into a large paunch or rumen; connected with the paunch is a smaller sack called the reticulum because

its lining is a network of folds; the adjoining compartment is lined with longitudinal folds like the leaves of a book and is therefore called the "psalterium" or manyplies. These folds are of varying depths; some genera are characterised by two depths of folds, some by three depths, and others by four.

There are three families of Pecora which may be distinguished, in addition to other characters, chiefly by the structure of their horns: (a) deer; (b) giraffe; (c) oxen.

Fam. Cervidæ or Deer.

The possession of antlers separates the deer family from all other ruminants, the structure and growth of which have been dealt with above. The antlers are variously developed and branched in the different groups of the family, and the parts of the antler have their technical names. The main shaft is called "the beam," the base of which is called "the pedicel"; the first branch above the pedicel usually directed forward is called "the brow tine"; the second branch from the beam is "the bay, or bez tine"; and the third "the tray, or trez tine." These tines may bear secondary branches or points, the mass of points at the summit of the antlers being called "surroyals." In the elk and the fallow deer the beam expands above into a "palm." At the base of the antler there is a rough ring known as the "burr." It is just below the "burr" that the beam becomes weakened by a process of absorption when the antler is about to be shed. Deer usually shed

their antlers every year. Fossil forms show a very interesting evolutionary development of the antler from very simple forms to the complicated weapon carried by the great Irish elk, or rather fallow deer (*Cervus megaceros*).

Deer are found all over the world except in Africa and Australia. In Africa they are replaced by the antelopes, which have bovine or permanent horns. Antelopes possess a gall-bladder, an organ which is entirely wanting in the digestive apparatus of the true deer, as it is in the elephant. This is an interesting fact, which makes one wonder as to the nature and function of this organ. The different kinds of deer vary considerably in size, from the Canadian moose, which is 7 feet at the shoulder, to the Chilian pudu, which measures only $13\frac{1}{2}$ inches. They are covered with hair, which they shed twice a year, rapidly in springtime and slowly in autumn. There are glands between the hoofs and some have glands on the hind legs. The axis deer are spotted at all ages and seasons; some are spotted only in their summer coats and when young. The red deer, fallow deer and roe deer are now the only British species, though the fallow deer is said to have died out and been re-introduced by the Romans. In Pleistocene times the reindeer and elk or moose were also natives.

The Red Deer (Cervus elaphus).

The red deer, which is the glory of the Scottish and Devonshire deer forests, where it is truly wild, has, as its name implies, a glossy reddish-brown

coat in summer, which becomes greyer in winter. The male stands 3 feet 6 inches to 4 feet 3 inches at the shoulder, and measures 5 feet 6 inches to 6 feet 6 inches from the nose to the tip of the tail.

The antlers make their first appearance in the male at eight to ten months. They are shed every



FIG. 47.—The Red Deer (*Cervus elaphus*). (Photo. from life by J. E. Adlard.)

year and increase in complexity with each new growth. "The first horns," says Mr. Millais,* "in the feral race are straight and simple spikes about 4 to 7 inches long, with a small coronet. During the following year brow points are added, and afterwards points grow according to the peculiar type

* *Loc. cit.*, vol. iii, p. 93.

inherited from the parents." Some wild stags never grow additional points, but the beam lengthens. "Following a normal course in the wild animals, we most commonly see eight points at four years old and twelve points at six, when they may be said to be adult. But there is no hard and fast rule, for wild stags are frequently 'small royals' at four years old. It is unusual to find wild Scottish stags with more than twelve points, but in Exmoor and Irish examples fourteen is not uncommon."

The development of antlers depends, Mr. Millais says, on the conditions of food and shelter, and the finer antlers of the fossil forms would suggest that they had had richer pasture and wider range.

Various names are given to the red deer, according to its sex, age, and development of antlers.

Hart or stag . . . = adult male.

Hind . . . = female.

Calf . . . = first year male.

Knobber, knobbler, or

pricket . . . = second year male.

Brocket . . . = third year male.

Staggard or staggart = fourth year male.

Royal or royal hart . . . = male with antlers
bearing twelve points.

Imperial . . . = antlers of fourteen
points and over.

Except in the breeding season the sexes live apart; the stags and hinds each in small herds, but there is always one male, who is the leader or "master." The hinds rarely wander from the place where they were born. Park stags attain their

maximum development from seven to eleven years old and then deteriorate. They are usually shot at the age of six or seven years, and the wild ones when from seven to eleven years old.

The English wild stags shed their horns in April, and the new ones are fully developed in October. Scotch wild stags are a month later, according to Mr. Millais, and park stags a month earlier, but much depends on the weather and the season. Shed antlers are rarely met with in parks, and it has been ascertained, without doubt, that the deer eat them, in spite of the fact that they have no upper incisor teeth, wherewith to gnaw such a hard, bony substance.

In September the mountains re-echo with the bellowings of the stags in search of the hinds, for the breeding season has commenced, and it is then that the rival "monarchs of the glen" meet in the deadly conflict with which, Landseer has made us all familiar. The young are born in May or June, one, rarely two, at a birth, and they are very prettily spotted.

It is impossible to give a better impression of the red deer than that which has been so ably expressed by Mr. Millais :*

"Beyond question the red stag is the finest wild animal that our islands contain. With his delicate nostrils accepting the breeze and his head thrown well back he looks the embodiment of all that is noble and free. Away up in his home among the clouds there is something majestic in his bearing. He is just the right thing in the right place. We

* *Loc. cit.*, vol. iii, p. 116.

expect to see something of the kind in that towering world of rocks and waterfalls, and we are not disappointed. He is the very spirit of the northern wastes, and in his stronghold among the boulders of the grass forests he looks around with the tranquility of possession. The giant moose, the great white-necked caribou, and the noble antlered wapiti are each and all fascinating to those who have hunted them, but in dignity of movement none can compare with the red stag as he moves up the hillside with his machine-like trot, the very embodiment of grace and beauty."

Red deer live preferably in the shelter of woods, where they can lie down and chew the cud during the day, coming out into the open glades at dawn, and at sunset to feed. In some parts of the Highlands there is no shelter but the rocks, and the deer are obliged to live in the open like sheep. Their food consists of grass, leaves of trees—such as birch, beech, hazel, ash, thorn, alder, and lime—the young shoots of conifers, beech mast and acorns. If within access of root crops they will eat turnips, carrots, and cabbages, treading down and spoiling more than they eat. Spring wheat is a dainty morsel, and they enjoy lying in the cornfields in autumn. Only enthusiasm for the sport can make the farmer endure such ravages silently. "Licks" of rock salt are always placed in parks where deer are kept, as they, in common with all ruminants, relish salt probably as a digestive.

They have keen senses both of sight and hearing, and when angry lower their ears and grind their

teeth. To those familiar with a deer park, the bellowing of the stags in autumn and the deep bark of the hinds are well-known sounds.

It is said that a slightly wounded stag travels up wind and up hill, and then lies down looking back. A badly wounded stag travels down wind and down hill.

They will jump to a height of 7 feet, and leap across a space of 20 feet. The distance between the two stones said to have been placed at "Hart's Leap" on the borders of Ettrick by a Scottish king is 28 feet.

Mr. Millais says that in the woods of Somerset and Devon it is a well-known fact that the cunning old stags make "fags" of the younger ones about three or four years old. If the herd is disturbed the fag is thrust forward, and the old stag will occupy his couch. But the same author adds:

"If you go into a park or forest for a year and study the deer, you will see them do things that are well known to naturalists for 364 days, and on the 365th day you will see something quite unusual and perhaps unrecorded, but that depends on your powers of observation."

The same may be said with regard to the observation of any living thing, whether animal or plant, although so much depends upon the observer. We all remember the little girl who, when told to watch and record the habits of her cat, said that it never had any habits when she was looking at it.

It is as impossible to tame a stag as it is to tame a lion. At two years old he becomes dangerous, perhaps even more dangerous than a lion.

Deer are subject to a very tiresome disease, the nature of which was only discovered, as recently as 1894, by Friedrich Brauer. It is caused by a species of bot-fly (*Cephenomyia rufibarbis*), a very handsome insect which chooses the respiratory passages of the deer between the nose and throat as a cradle for its young. Alighting on the nostrils of the deer, this bot-fly squirts into them a fluid containing active maggots. They make their way along the passage to the throat, and there attain the length of an inch, causing severe irritation, coughing and sneezing, by which actions they are cast out on the ground, and there rapidly change into pupæ; from these the flies emerge to carry on their life-history at the expense of the deer.

Red deer are both chased on horse-back with hounds, or stalked and shot. One can understand there is true sport both in hunting and stalking the wild deer. Powers of endurance are required, and a knowledge of the ground, and of the natural history of the animal pursued, which in its turn is more familiar with the country than the hunter, and has, moreover, the free use of its limbs; whereas the practice of running after a deer which has been fed in a stable and carried in a cart to a convenient place for the hunt and then let loose, to be chased over ground to which it is a stranger, seems but an employment for cowards. The least one can say is that many of those who pursue the "carted deer" do not pause to think of, or care anything for, the natural history of the animal they chase. There is the enjoyment of the cross-country

ride, but such hunting would never have inspired the songs and ballads of the chase with which our literature is so rich. The famous ballad of "Chevy Chase" tells of the feud between Earl Percy of Northumberland and Earl Douglas, which arose because—

"The Persé owt of Northombarlande*
 And avowe to Gode mayd he,
 That he wold hunte in the mountayns
 Off Chyviat within dayes thre,
 In the magger† of doughte Dogles,
 And all that ever with him be.
 The fattiste hartes in all Cheviat
 He sayd he wold kyll, and cary them away :
 'Be my feth," sayd the dougheti Doglas agayn,
 'I wyll let‡ that hontyng yf that I may.'"

As the Percy family are said to have owned twenty-one parks and 5500 head of deer, it seems unnecessary to have gone over the Border to take the Douglas' deer and to have killed the Douglas into the bargain.

Ossian, the mythical poet of the Highlands, whose poems James Macpherson claimed to have collected and translated, makes his son Oscar say—§

"King of Inis-thona," said Oscar, "How fell the children of youth? The wild boar rushes over their tombs, but he does not disturb their repose. They

* "The Hunting of the Cheviot," English and Scotch popular Ballads,' E. I. Child, vol. iii, p. 307, 1888.

† In spite. ‡ Prevent.

§ Linder, 'Poems of Ossian,' translated by James Macpherson (London, 1806), vol. i, p. 130.

pursue deer formed of clouds, and bend their airy bow. They still love the sport of their youth, and mount the wind with joy."

From early Saxon times the privilege of hunting the deer in English forests belonged solely to the king. Barons who held freehold land could obtain a licence to hunt in their own domains, and could also procure licences to empark an unclaimed area, and construct deer-leaps or saltatoria. A saltatorium was a ditch so constructed as to enable the deer to leap into the park, but not out of it.

Not only was the chase the recreation of kings and barons, but the bishops also had their deer parks. At the time of the Reformation the See of Norwich owned thirteen deer-parks, and the Archbishop of Canterbury had the right of hunting in twenty parks. Henry VIII, Elizabeth, and James I were devoted to the chase, but during the kill-joy period of the Commonwealth the upkeep of parks declined, and most of the deer parks now existing were re-stocked and re-formed at the Restoration. Red deer are to be found in eighty-six English parks. Of these the largest is Savernake Forest, over 4000 acres in extent; next in size come Windsor and Eridge. In most of these parks fallow deer are also kept, but in Blenheim, Bolton Abbey, Barmingham and Calcot parks red deer alone are kept. Red deer are found wild in three localities in England. Their chief stronghold is in the wooded valleys and moorlands of North Devon and Somerset, where they have roamed since the days of the Saxons. A few head remain in Martindale Forest in Westmoreland,

and a few in the New Forest, but Mr. Millais doubts if these are really indigenous animals.

The description given by Gilbert White of the wild deer in Woolmer Forest, in Hampshire, will be familiar to his readers.

The heads of the Exmoor wild stags are very different from the heads of Highland wild deer. There is a grace and elegance in the form of the Devonshire antlers which makes them peculiarly fascinating.

Sheep farming has not paid recently in Scotland as it did in the years 1840–1870, consequently there has been considerable re-afforesting. There are now about two million acres of deer-forest in the counties of Aberdeen, Argyll, Banff, Bute, Caithness, Forfar, Inverness, Perth, Ross, and Sutherland.

In Ireland the distribution of wild deer is now limited to the wilder parts of Connaught and the district around the Lakes of Killarney. There is a white or albino variety of the red deer in a few parks in England. They have pink noses and blue or yellow eyes.

Fallow Deer (Cervus dama, Linn.).

This deer is smaller than the red deer. Its summer coat is a rich fawn or chestnut, spotted with white; a black line runs along the top of the back and through the tail, and a very distinct white horizontal line crosses each flank. In winter the spots disappear, and the animal is a uniform greyish colour. The tail is long and white except on the

upper surface, and the head and ears are comparatively short. Such is the usual colouring of the fallow deer, but there is considerable variation, possibly owing to domestication. The fallow deer of Epping have a blackish-brown pelage. It was said that this variety was introduced by James I, but



FIG. 48.—The Fallow Deer (*Cervus dama*). (Photo. from life by W. S. Berridge.)

Mr. Harting* has shown there were black, white, and spotted fallow deer in Windsor Park in 1465.

The male fallow deer is called a buck, the female a doe, the young a fawn. Fallow deer may be distinguished from red deer mainly by their smaller size, by their colouring, and by the form of their

* 'Essays on Sport and Natural History.'

antlers. The height of a fallow deer at the withers is 3 feet, and the length from nose to tip of tail is 5 feet 8 inches. The horns of the male bear no bez or bay tine. The brow and tray tines are well developed, and above these the beam is palmated, and at the base of this palmation there is a backwardly directed point. The horns make their appearance in the summer of the second year, much later than those of the red stag. At first the horn is a simple point 2 to 5 inches long. In the next season, when the buck is three years old, the brow and tray tines are developed and the beam shows an inclination to palmate. In the fourth and following years the points on the posterior margin of the palmation increase until the sixth year, when they are fully developed and the buck is adult. The horns vary in type just as the pelage varies in colour. The Epping Forest deer, of which we have spoken as having blackish-brown coats, have very poor horns, rarely more than 20 inches long and with a very narrow palm. The New Forest bucks carry horns with from twelve to twenty points, and so little palmation as to make them very like the horns of the stag. Purely wild fallow deer are found in Spain, Portugal, Greece, and North Palestine. Those living now under wild conditions in England in the New, Epping, and Rockingham Forests have been introduced, and are not the direct descendants of native animals as the red deer of Exmoor are. No fallow deer horns are found in recent peat formations; thus there is no evidence that the British fallow deer of Pleistocene times survived the second glacial period.

Fallow deer have been hunted in Epping Forest since the days of Canute, whose standard bearer, Tovi, seems to have organised the hunt for the king, and all the English sovereigns have hunted there from the Norman Conquest up to, and including, Elizabeth, who is said to have been able to shoot the buck with her crossbow with "great surety." The re-introduction of fallow deer to this forest has, with many other importations, been attributed to the Romans, but Mr. J. G. Millais holds the opinion that it is much more likely that these animals were landed in England long before, by the enterprising Phœnician sailors.

Shooting the fallow deer with horse, hounds, and crossbow was formerly a very favourite after-dinner summer amusement from mid June to mid September. "Every man," says Moryson in his 'Itinerary' (1617), "with an income of £500 to £1000 hath a park for them (fallow deer) enclosed with pales of wood for two or three miles' compass."

With present-day weapons buck shooting is not considered to afford the highest kind of sport. In the New Forest they are still hunted with hounds.

Fallow deer were kept in Hyde Park from the days of Henry VIII to the Coronation of Queen Victoria, when they were removed to Bushey on account of the Coronation Fair.

Inasmuch as they are not dangerous, fallow deer are more commonly kept than red deer, and are to be found in 390 English parks.

The Hon. G. Lascelles says that all the New Forest fallow deer have the same colouring. In

summer they are all fallow, *i.e.* light red with whitish spots on their sides. The brightness of these spots may vary but the colour never, and all change their coats together in May and October. In winter they are dark brown on the back, with dun legs and bellies. Mr. Lascelles thinks this herd the oldest in the country, dating from a period prior to the Norman Conquest, and even from the time of Canute. They have always been quite unrestricted, and there is no record of any cross, except with the few that were introduced from Sweden and Denmark by James I.

Henry I (1100–35) granted the citizens of London a day's hunting in Epping Forest, and so instituted the Epping Forest hunt. Henry III (1226) also granted the same privilege once a year, at Easter. Henry VIII was hunting in Epping Forest when he heard the gun fired announcing the death of Anne Boleyn. This forest was kept intact as a hunting ground until 1851, when a portion of it (Hainault Forest) was disafforested by Act of Parliament and turned into arable land. In recent years Hainault has been restored to the ancient forest and re-afforested. The Epping Forest fallow deer are known as the "old forest breed." In 1887 there were eighty to one hundred head, but the herd is increasing. A few bucks only are shot by the verderers every year.

Mr. Millais says that fallow deer were introduced into the forest of Dunkeld by the Duke of Athol early in the nineteenth century. Here the animals bear horns, which are short and massive. This deer

is also found at Rosehall in Sutherland, in Central Argyll, and at Drumlanrig in Dumfriesshire.

The fallow deer was not introduced into Ireland till the Middle Ages, but it is now found wild in many parts of Tipperary, Clare, Waterford, Cork and Kerry.

In parks the fallow deer may be seen in small parties of one sex, except during the breeding season. Their food consists principally of grass and leaves of trees. They are particularly partial to chestnuts, and will also eat thorn and ash bark, and, when food is scarce, holly and ivy. They are more restless than red deer, feeding more frequently, and taking shorter ruminating intervals. In winter they are on the move all day long.

Their horns are shed in May, the older bucks losing theirs first; the growth is complete in August and rubbed clean of its velvet by September. The breeding season is in October, when the bucks fight for their wives, but they rarely kill one another as stags do. In the following year in June the doe produces one fawn. Old bucks become exceedingly cunning and for this reason are difficult to shoot. Mr. Millais speaks of one old white buck at Warnham, who invariably left the pack when buck shooting began in September and always returned over the deer fence at the end of October. They have very keen senses both of seeing and smelling and will avoid roads, or any human track. Often when moving they will take a leap into the air as if to avoid a trap. They are also very good jumpers, though their horizontal leap is not so wide as that of the red deer.

Mr. Millais tells of a tame buck belonging to Sir Philip Brocklehurst, which would join the family at breakfast and lie down by his master's chair. Sir Philip could summon the deer in his park with a horn and they would come round him to eat the maize he carried in his pockets. When changing their coats in May and October they do not wallow as the red deer do, but will pull out their hair in mouthfuls. Deer get up from the ground as cows do, by getting on to their knees, then raising their hind quarters and standing first on their hind feet and then lifting the front ones, whereas the horse raises the front legs, and standing on the forefeet, raises the hind quarters.

The New Forest herd of fallow deer had increased so much between 1820 and 1830 that the herd numbered some thousands and became a great nuisance to landowners and owners of common rights. The Government made a bargain to get rid of the deer in exchange for the right to plant 10,000 acres in perpetuity free from common rights. At first it was an easy matter to slay the deer, but as their numbers decreased the difficulty of catching them increased. Mr. Lovell undertook to hunt them with a scratch pack of bloodhounds and draft fox hounds with which he succeeded in almost exterminating the fallow deer, but a few took shelter in adjacent manors and woods, and the newly planted 10,000 acres rapidly grew up into a safe sanctuary for this small herd, and has happily preserved the old New Forest race of fallow deer.

Two species of fallow deer have been found fossil

in the British Isles. *Cervus megaceros*, the giant fallow deer or Irish elk, which must have been the finest animal of the Pleistocene age, is found abundantly in the Irish bogs of Tullamore and Lough Gur in Limerick. This grand animal stood 7 feet high at the withers. A few good specimens have been found in the south of Scotland, and remains of this deer have also been found in the Thames valley, but they are not well preserved.

The second species of Pleistocene fallow deer is *Cervus belgrandi*, the remains of which are found in the Norfolk forest beds.

The Roe Deer (Cervus Capreolus, Linn.).

This little deer is the smallest of the three kinds of deer common in English parks. The male is called the roe buck, the female the roe doe. It is only 4 feet long from the nose to the tip of the tail and stands but a little over 2 feet at the withers.

In summer the coat, which is rather thin and coarse, is bright red above and paler on the under parts. In winter it is greyish-brown and the hair is long and soft. There is a pure white patch on the rump and sometimes a white patch on the neck. The ears are lined with long hairs and bordered with black. The tail is very short.

The fawns are dark brown above, and have lines of cream-coloured spots on the rumps. There is a marked difference between the horns of this species and those either of the stag or fallow buck. The first antlers of the roe buck, which are fully formed at fifteen months, are simple spikes. The second

winter the antlers are forked and there are two spikes, and in the third winter the three tines of the adult appear. The antlers attain their maximum development from the fifth to the ninth winter, and are then from 8 to 11 inches in length.

Roe deer were widely distributed and very numerous in England and Scotland during the Pleistocene period, but were not indigenous in Ireland. Remains of the roe are found in the Norfolk forests beds, the brick earths of the Thames valley, and the fens of Lincolnshire and Cambridgeshire. In the present day the native wild animal is mainly restricted to Scotland, though a few are still found at Naworth and Netherby in Cumberland and some few in Northumberland and Durham. The native roe became extinct in Wales about the time of Elizabeth.

In the beginning of the nineteenth century roe were re-introduced to Blackmoor Vale, Dorsetshire, and the New Forest, also to Petworth Park in Sussex and the woods around Virginia Water and Epping Forest. The herd of roe deer introduced into Dorsetshire have increased and have spread westwards into Somersetshire. Mr. Millais finds no evidence of deterioration from the fossil type, but, if anything, he sees a slight improvement.

The same author quotes the 'Liber Eliensis' (Stewart), a book of statistics drawn up for the information of William the Conqueror, which tells us that, among the natural productions of the Isle of Ely, harts and hinds, roes and hares abounded in its woods.

Mr. Harting, in his 'Essays on Sport and Natural

History,' mentions a charter of liberties granted by King John to the people of Devonshire in which roe deer are mentioned, and he also tells us there were roe deer in Pickering Vale in Yorkshire in Edward III's time. In the north of Scotland the wild roe deer are widely distributed, but they constantly change their ground and try to get into woods adjoining arable land. Mr. Millais says in his experience the best are always to be found within a radius of twenty miles of the towns of Perth, Forres, and Beaulieu, and that there are probably more of these little deer in the woods round Cawdor Castle than anywhere in Scotland.

The re-introduction of the roe to Ireland has not been, on the whole, successful, though those round Lissadell in Sligo produce horns which are equal to those of any German roe.

Roe deer are not gregarious like the red and fallow. They may be seen consorting in small parties of two or four. During August and September the bucks go up into the hills; they then return to their mates and stay with them till the following May, when the doe drives off her calves of the previous year, and prepares for the birth of her two young ones, which are usually born about the first week in June, and as a rule are male and female. The buck may remain near her or go in search of another mate. Though they generally appear to consort in pairs, they are not strictly monogamous. Sometimes during the winter, Mr. Millais says, four or five does may be seen with one old buck. Roe deer feed from before dawn till the

sun is hot and again from sunset to nightfall. During the day in summer they will lie out in the heather or on the open moor; in winter they seek the shelter of woods and coppices. On bare ground they will scrape out hollows to lie in, and if troubled by flies they will run round a bush to brush them off. The roe feeds very close, the food consisting principally of the leaves of shrubs and trees, such as birch, beach, holly, rowan, and young shoots of bramble, heather, spruce, and oak. They will also eat hips and haws and certain fungi, and growing corn, turnips and clover, when such luxuries are within reach.

The movements of the roe are exceedingly graceful, springing over the heather in a series of bounds. They are excellent jumpers and good swimmers. Indeed, their agility is only equalled by that of the chamois. Their senses of sight and hearing are keener than those of the red deer, and they pick up the scent of man equally well, though not at such long distances. They are always loth to leave their cover, and when disturbed will stop, prick their ears to listen, and look intently.

"A roe doe," says Mr. Millais, "makes a charming pet, but the buck is not to be trusted. Once the male reaches the age of maturity he exhibits a savage disregard for all persons, especially women, and will, without warning or the smallest provocation, attack with great fury."

Up to the time of Henry VIII and Elizabeth, roe deer were hunted with horse and hound, as they are now in France. In the first half of the nineteenth

century some few packs were kept for hunting roe deer in England, but they are now usually coursed down or shot.

Mr. Millais is of opinion that "by far the best sport with the roe buck is obtained by stalking it with the rifle, in the early mornings of summer and autumn. . . . The delight of the rifle shooter is to 'still hunt' or stalk the roe in his broken fastnesses in that most delightful time of the year when no other sport with gun or rifle offers itself."*

The same sportsman considers the venison of the roe is not esteemed, in this country, as it should be. Between April and the end of September, the roe buck should be shot for his head only, but from the end of October to March, it is in fine condition for the table. The meat is dry, unless carefully cooked, being very lean.

The chief enemies of the roe are foxes and eagles. They kill numbers of fawns and will often attack a full-grown animal.

Another enemy is the roe-fly, a kind of bot-fly which enters the body with the food, and works its way to a position between the flesh and skin of the flank. Here it causes a large swelling, from which the full grown fly escapes in June and July. They also suffer from liver-fluke and tape-worm.

Few amongst us have had the opportunity of watching the wild roe deer in their native haunts as Mr. J. G. Millais has, but we cannot fail to appreciate his description of the sight. He says:†

* 'Autumns in Argyllshire,' "British Deer and their Horns."

† 'Mammals of Great Britain and Ireland,' vol. iii, p. 168.

“There are few more delightful animals to study than the common roe when we look for them with the eyes of the naturalist among the young plantations in spring, when all life and nature are awakening from their long sleep. In summer, too, they show themselves more than at other seasons. You must be out early and late to enjoy their society as a rule, but with the coming of the lush grass and the growth of plant life all mammals seem to put aside their fears and come into open ground at all hours. You may sit watching a likely hillside, when a shaking bramble shows you the head of a roe nibbling the tender shoots. Slowly he stretches forth his graceful limbs across the bush tangle and comes into view, while the sun plays on his brilliant coat and glistening horns. He licks his legs, stamps and shakes his head to brush away the flies, stretches himself with arched back, and drops half hidden under the lee of some peat hag. For two hours he scarcely moves, but sits dozing and ruminating in peaceful content. At times he dozes all day in a cornfield, or among rushes, but as night comes on he becomes bolder and canters out into the open glades, where he can chase his wife or spar with some young buck. At this season, if a man passes along a road or forest path he simply stands quite still and relies on his own invisibility in the dappling shadows for protection. If some strange sound is heard, or enemy seen for a moment and then lost sight of, he will stand and stamp and bark at intervals. It takes a long time to allay his suspicions. In June and July the parasitic flies make their

attack, and you may see him emerge from cover and rush hither and thither trying to shake off his enemies. He snorts and stamps, but it is of no avail; often in despair he rushes blindly back to cover."

The Reindeer or Caribou (Rangifer tarandus, Linn.), and the Moose (Alces machlis, Ogilby).

Both the reindeer and the moose or elk were formerly inhabitants of the British Isles and coeval with prehistoric man. Now these animals are circumpolar, though the pair of antlers found in the peat of the Curragh bog, which are exhibited in the Dublin Museum, is a proof that this individual at least survived into recent times, and Mr. Harting* quotes a passage from the "Orkneyinga Saga" as translated by Torfæus in his history of Orkney, which speaks of the jarls of Orkney being in the habit of crossing over to the moorlands of Caithness every summer during the twelfth century to hunt the roe and the reindeer. But as philologists are not agreed as to the correct translation of this passage, and some aver that for reindeer, we should read red deer, we are still in doubt whether reindeer did live in Britain during the historic period. With the increasing warmth, after the second glacial period, the food plants of the reindeer doubtless became scarce, and with them the animal was driven further and further northwards.

Excellent etchings on reindeer horns and bones and on slate have been found in France. One

* 'Animals Extinct within Historic Times,' pp. 72-73.



FIG. 49.—Reindeer or Caribou (*Rangifer tarandus*). (Photo. from life by Sports and General Press Agency.)

remarkable etching on slate from the bone caves of Les Eyzies, Dordogne, depicts with considerable artistic skill and spirit, reindeer fighting. Just in the same way the Lapps of to-day scratch pictures, at their leisure, of the animal which plays so large a part in their daily lives. Indeed, one might say that existence would be almost impossible to the Lapp without the reindeer. Alive, the animal gives him milk and drags his sledge, and its cast antlers serve as material from which he makes spears for fishing. When dead, the flesh provides food, the skin clothing, tent covering and leather; the tendons are made into sewing thread and the intestines into ropes; the bones also serve for the construction of many useful implements.

The horns of the reindeer are palmated, the palmation extending to both the brow and bez tines. One of the brow tines is usually much more developed than its fellow and bent right over the forehead. It has been remarked that this tine serves admirably for a snow plough. The reindeer is peculiar in that both sexes develop horns.

The hoofs are deeply cleft and spreading, and the posterior toes are well developed, almost touching the ground. The large area covered by the foot enables the animal to walk, without sinking, through marshy ground.

Reindeer "moss" (*Cladonia rangiferina*), which is not really a moss but a lichen, is the reindeer's main food, which the animal finds beneath the snow by means of its strong sense of smell.

Several attempts have been made to introduce the

reindeer into Scotland, but all have so far proved unsuccessful.

The moose, or elk, also, has palmated antlers, remains of which have been found abundantly in England and Scotland, but there is no satisfactory proof that the true elk ever inhabited Ireland. The so-called Irish elk is the giant fallow deer (*C. megaceros*) referred to above. It existed in England in the Pliocene period, and therefore before the reindeer. Julius Cæsar speaks of it as an inhabitant of the Black and Hercynian Forests, and a few still linger in East Prussia. It is also found in Russia, Finland, Norway, and Sweden. But we connect the moose more especially with the north of North America, where it exists now in great numbers. For a member of the deer tribe the moose is a strangely awkward-looking animal. Deer seem to be the embodiment of grace, amongst herbivorous animals, just as cats are amongst carnivores. Nevertheless, ugly as he may appear, the moose is admirably adapted to his surroundings in a marshy forest. His hoofs, like those of the reindeer, are capable of spreading, being connected by an extensile skin. The legs are very long and ungainly, but very strong, the upper lip is wide, protruding and snout-like. The moose feeds on the leaves and bark of willow and birch, and owing to his short neck and long legs is unable to graze on level ground. In winter one male and several females will form a "moose yard" in the forest by trampling down the snow in some chosen area.

Giraffe (Giraffa camelopardalis).

When considering the ruminants we cannot exclude the giraffe, so well known by its extraordinary form which is so distinct from that of any other animal. The very long neck has, however, only the normal number of vertebræ, *i. e.* seven. The small head is raised 17 feet to 20 feet from the ground, and the animal measures 10 feet at the withers. The body is short, and slopes abruptly to the quarters, and the hind legs are shorter than the fore-legs. The horns are bony prominences which are covered with skin, with a terminal tuft of hairs. There is a boss of bone or incipient third horn. Both male and female are armed with these horns, which are never shed. The giraffe feeds principally on leaves of trees, inaccessible to other animals. The colour of its skin is pale yellow, with chocolate patches, but the colour and arrangement of these patches vary in the different species. The dappling colour is said to make the animal practically invisible among the mimosa bushes, upon which it feeds.

It is to this dappling, too, that it owes its name of camelopard. The Romans, who first brought the animal to Europe, considered it to be the size of a camel with the ferocity of a panther. In captivity the giraffe is nervously irritable, and can give formidable blows with its horns, wielded by the powerful neck.

The name "Giraffe" is an Arabic word, meaning "one who walks swiftly."

In walking the giraffe lifts both limbs on the

same side together, which produces a peculiarly swinging gait. The forelegs are so long that it is needful to stretch them widely apart when the animal is feeding on the ground or drinking.

Two, if not three, species of giraffes are known, all natives of Africa, and recently Sir Harry Johnston has described a species with five horns living in Uganda. The same naturalist brought home from Africa the skin and skull of a giraffe-like animal called by the natives "Okapi," which is striped, not dappled. This skin has been mounted, and may be seen in the British Museum of Natural History. Later Sir Harry Johnston contributed from the Semliki forest the complete skin of a female animal of the same kind, which has received the scientific name of *Okapia Johnstoni*. More recently, a cast of the skull of a male Okapi has been added to the exhibits in the Museum, which shows that, the male bears one pair of skin-covered horns, while the female is hornless. Sir E. Ray Lankester has written a monograph on these extraordinary animals.

Oxen, Sheep, Goats, Antelopes—Bovidæ.

This group includes the animals which, with horses and dogs, man has especially adapted to his use, and by centuries of domestication distinct races have been produced, the origin of which it is now impossible to trace.

The Bovidæ are distinguished from deer mainly by their horns, which are present in both sexes except

in the case of sheep, goats, and some antelopes. These weapons are hollow, horny structures situated on a bony core, and are not shed as the antlers of the Cervidæ are, but are of persistent growth.

We find no difficulty in distinguishing the domesticated members of this family—the oxen, sheep, and goats—but in the wild state sheep are not covered with thick wool, which is a development of domestication; they are hairy as goats are, and in many cases are very difficult to distinguish from goats. Antelopes, though deer-like in form, have the bovine hollow horns and persistent horn-cores. They are the oldest members of their race, dating back to the Miocene.

Oxen.

The oldest historical records speak of domestic herds of oxen. The Egyptians had their domestic cattle, and so had the Babylonians two thousand years before them. To the Egyptians the cow was sacred, and the beauty of their representations of this animal has never been surpassed, expressing, as they do to an eminent degree, grace of form, gentleness, and nobility of mien, coupled with protecting strength.

The bull seems always to have retained his wild instincts, and has never really been tamed.

Oxen are widely distributed, but were never native in the Australian region, South America, or Madagascar.

Oxen, sheep, and goats provide man with flesh and milk as food, and their coats and skins provide him with raiment. The great strength of the ox has from

time immemorial made him a valuable beast of draught, and even to this day his steady pace and powerful muscles enable him to draw the plough in hilly places, in England, which would be impossible to a horse. The ox walks on the tips of the third and fourth digits, the metatarsals and metacarpals of these bones



FIG. 50.—Channel Island Cow. (Photo. from life by H. C. Wood.)

being united to form cannon bones. The second and fifth digits are more rudimentary than those of deer, and do not reach the ground. The bones of the skull are massive and the forehead wide. The powerful muscles of the neck enable the animal to wield its heavy head and horns with disastrous effect

on its enemies. The maximum strength of the ox is in his neck, not, as in the horse, in his shoulders. Thus it is to the head of the ox that the yoke is usually attached.

Food, in large quantities, is needed to support the huge frame of the ox. The food is entirely vegetable, consisting mainly of grass. The rough tongue grasps bunches of grass, which are pressed by the toothless front part of the upper jaw against the eight chisel-edged front teeth in the lower jaw. These eight teeth consist of six incisors and two canines, which last, have the same form as the incisors. Between these front teeth and the molars at the back there is a wide toothless gap. The molars of the upper jaw do not meet those of the lower jaw, because the upper jaw is wider than the lower one. The grinding action of these teeth is brought about by the lateral movement of the lower jaw, which may be noticed any day when a cow is "chewing the cud." The food is gathered as opportunity occurs; it is swallowed rapidly, unmasticated, and passes into the paunch or rumen, the first and largest compartment of the four-chambered stomach. When this organ is sufficiently filled, the domestic ox lies down, and begins the process of "chewing the cud." If it be a wild animal it seeks some place of safety from its enemies. The unchewed food passes into the second chamber—the reticulum or honeycomb stomach—where it is softened and moistened and formed into pellets or boluses, which, by a convulsive action, something like a hiccough, are forced back along the œsophagus into the mouth, to be thoroughly ground

down by the molar teeth and mixed with saliva, until a soft pulpy mass is formed, which, when swallowed, finds its way into the third division of the stomach, known as the psalterium or manyplies from the folding of its membranous lining. Thence the food passes into the abomasum or rennet stomach, where digestion takes place. The digestive system is in every particular, both as to the form of its organs and its chemistry, specially adapted to the absorption of nutriment from vegetable food. The powerful teeth grind down and break the hard cellulose envelopes in which the nutritive elements of vegetables are enclosed. The stomach is large in proportion to the bulk of food required, and the small intestine is extremely long, being in the ox twenty-two times the length of its body. The cat, on the other hand, which is a flesh feeder, has a single-chambered stomach, a large œsophagus, and a relatively short small intestine. Further, the gastric juices secreted by the cat are suitable for promoting the rapid digestion of flesh.

Thus we see that, both by their mechanism and their chemistry, the digestive systems of oxen, sheep and goats are admirably adapted for the transformation of the grass of the field into suitable food for man. Much as we may revolt from the slaughter of animals, we have to deal with the digestive system with which Nature has endowed us, and the human digestive apparatus undeniably demands a mixed diet, consisting mainly, though not entirely, of flesh, whereas a dog's or cat's digestive system is only able to deal satisfactorily with flesh food.

Amongst the cattle of our farms and pastures we notice considerable variety of size, form and colour. Very early in his history man discovered the useful potentialities of these animals and pressed them into his service. He has carefully bred various races, some for producing quantity, others quality of milk; some for the quality of their flesh as a food, and others for draught. There are cattle with horns and others again which are hornless, or polled. The origin of all these races is lost in oblivion, though it is generally believed that they are derived from the same stock as the semi-wild cattle, some of which are still kept in a few English parks, and that their common ancestor was the aurochs or urus (*Bos taurus*). With this view Mr. Millais does not agree, and while he gives the name "*Bos taurus*" to the herds of wild cattle in our parks, he calls the Aurochs "*Bos primigenius*." The reasons that he gives for his view that the wild cattle are not descended from the Aurochs are:

(1) That there is no evidence that the aurochs survived in England up to the period of the Roman occupation, other than the story that the war chariot of Boadicea was drawn by a pair of aurochs, though the bones of this animal have been found together with bronze celts in Scotland.

(2) That whereas the heads of the existing wild bull and wild cow are very easily distinguished, the fossil heads of the aurochs betray no evidence of sex.

(3) The only horn of the aurochs which has as yet been discovered in England has corrugations

at the base, which are never found on the horns of any of the wild cattle.

This horn of the British aurochs was fished up out of the river Ribble, and is now in the Blackburn Museum.

In Pleistocene times there were three species of cattle: The great bison, or *Bos priscus*; the aurochs (*Bos taurus*), which Millais calls *Bos primigenius*, and the European bison, *Bos bonasus*, which is often erroneously called the aurochs, thus causing greater confusion in an already difficult group. The true aurochs, *Bos taurus* or *primigenius*, and the European bison, *Bos bonasus*, were both living in Germany and Russia up to the time of the middle ages. A herd of the European bison still survives in Lithuania and is the property of the Emperor of Russia. The Germans call this animal the "Wisent."

The aurochs (*Bos taurus* or *primigenius*) survived in Germany till the sixteenth century, but was extinct much earlier in England and Scotland. Skulls and other remains of the aurochs are found in England in the clays and brick earths, and also in the fens of Cambridgeshire. But, Mr. Millais says, there is no evidence to show that the aurochs or urus was domesticated by man.

The remains of two species of oxen, *Bos frontosus* and *Bos longifrons*, are found abundantly in the Thames alluvium and in the fens. The latter, *Bos longifrons*, the Celtic shorthorn, is said to be the ancestor of the small dark breeds of cattle found in Scotland and Wales. The remains of *Bos frontosus* indicate that it was a larger beast.

Mr. Millais, quoting Mr. E. R. Alston, says :

“The evidence appears overwhelmingly to prove that the modern park cattle are not wild survivors of the aurochs or urus, but are the descendants of a race which escaped from domestication, and lived a feral life, until they were enclosed in the Parks and chases of the mediæval magnates.”

Prof. Boyd Dawkins also maintains that our wild white cattle are descended from continental descendants of the urus, and that it is exceedingly probable that the domesticated oxen—*Bos longifrons* among them, which we may fairly suppose to have been the domestic ox of primitive man in Britain—were originally descended from the urus or some similar ancestor of the two.

The ancient herds of wild white English cattle are of extreme antiquity, and consequently are highly interesting. Many of them have now died out, but the most famous survivors are the Chillingham, Chartley, and Cadzow herds. These wild cattle are all white, but have only been kept so by artificial means, all the coloured calves being killed. The specimens of the Chartley herd in the Zoological Gardens have produced black calves for years, until the year 1910, when a white calf was born.

The English wild cattle have an extensive literature devoted to them, telling of their history and habits, and the evidence goes to prove that they were formerly much more numerous, and were systematically hunted. They are referred to in the Welsh laws of Howel Dha and in the forest laws of Canute granted at a Parliament holden at Winchester

in the year of our Lord 1016. The 27th law of Canute, as translated by Manwood,* says :

“And there be divers other beasts, which although they do live within the forest, and they bee under the charge of the Regardors, yet they cannot bee accounted beasts of the forest ; such are wild horses, bugalles, kine, and such like.”

Topsell† says a bugall is a kind of ox, bigger than the domestic ox and with rough, black hair, wild in disposition, and very strong for drawing waggons and ploughs.

Fitzstephen (1174) speaks of the presence of an abundance of wild cattle in the forests round London. Hector Boece, in his ‘Scotorum Historiæ,’ 1526, says wild white cattle with manes like lions frequented the great Caledonian forest, but no wild cattle have ever been recorded from Ireland.

Amongst the many deeds of prowess attributed to Guy of Warwick, we are told that he slew a big boar and a wild cow :

“ In winsor fforest I did slay ‡
A bore of passing might and strenght,
Whose like in England neuer was
For hugeness, both for breadth and lenght.

“ Some of his bones in Warwicke yett
Within the Castle there doth Lye ;
One of his sheeld bones to this day
Doth hang in the Citye of Conentrye.

* ‘A Treatise of the Lawes of the Forest,’ by John Manwood, 1615.

† *Loc. cit.*, p. 45.

‡ Percy’s ‘Ballads and Romances,’ ed. by J. W. Hales and F. J. Furnivall, vol. ii, p. 201.

“ On Dunsmore heath I alsoe slewe
A mightye wyld and cruell beast
Call’d the Duncow of Dunsmore heath
Which many people had opprest ;

“ Some of her bones in Warwicke yette
There for a monument doth lye
Which unto euey lookers veue
As wonderous strange they may espye.”

Boece tells of the origin of the surname “Turnbull.” How, when King Robert Bruce was out hunting a wild bull, the beast feeling himself “sore wounded by the hunters, he rushed upon the King, who, having no weapon left in his hand wherewith to defend himself, he had surely perished if rescue had not come. Howbeit, in this distress one came running unto him, who overthrew the bull by plain force, and held him down till the hunters killed him outright. For this valiant act the King endowed the aforesaid party with great possessions, and his lineage is to this day called of the Turnbulls, because he overturned the beast and saved the King’s life by such great prowess and manhood.”

The Chillingham herd, which has been immortalised by Landseer, inhabit an enclosure in the woodlands around Chillingham Castle in Northumberland. The estate once formed part of the great Caledonian Forest, as Cadzow Castle in Lanarkshire does, where there is another ancient herd.

The late Lord Tankerville, who studied the habits of the Chillingham cattle, writing in Storer’s ‘Wild White Cattle of Great Britain,’ says :

“They have in the first place pre-eminently all the characteristics of wild animals, with some pecu-

liarities that are sometimes very curious and amusing. They hide their young, and feed in the night, basking or sleeping during the day. They are fierce when pressed, but generally speaking very timorous, moving off on the appearance of anyone, even at a great distance ; yet this varies very much in different seasons of the year. . . . When they come down into the lower part of the park, which they do at stated hours, they move like a regiment of cavalry in single file, the bulls leading the van, and when they are in retreat the bulls bring up the rear."

The wild cattle of Chartley Park, Staffordshire, were reduced in 1905 to eight animals, which were purchased by the Duke of Bedford, and removed to his park at Woburn.

The American "buffalo," which has become extinct as a wild animal during the last fifty years, in consequence of the making of the great railways across the Continent, now survives only as a small herd in the Yellowstone Park. This animal bears a strong resemblance to the European bison (*Bos bonasus*), but is an inhabitant of open prairies, while the buffalo of N.W. Canada, known as the Wood-Bison (*Bos athapascæ*), affects a wooded country.

Sheep and Goats.

The musk ox, which, with the Saiga antelope, inhabited England in Pleistocene times, and is now entirely Arctic, forms a connecting link, as its scientific name (*Ovibos moschatus*) implies, between oxen and sheep. We owe the first discovery of its

remains in England to Lord Avebury and Charles Kingsley, who found them at Maidenhead in 1875.

Though there are many and varied breeds of wild sheep in the British Isles, they are not native races, and the origin of the domesticated breeds of sheep is even more obscure than that of our



FIG. 51.—Romney Marsh Sheep and Lambs. (Photo. from life.)

domesticated oxen. The bones of a wild sheep (*Ovis savini*) are found in the Norfolk Forest bed, but there is no knowledge of any domesticated sheep until the Neolithic period, and then *Ovis savini* was extinct. The remains of sheep and goats associated with primitive man are dissimilar in

form from any existing sheep or goat, so that we cannot point to any of them as the probable ancestors of our present races.

Both sheep and goats are natives of the Northern hemisphere. As we see them to-day in our English meadows, we find no difficulty in distinguishing goats from sheep. We point to the woolly coat of the sheep and to the hairy covering of the goat; but, as we have said before, the sheep's woolly coat has been produced by the herdsman, by careful breeding through many centuries. In its native state the sheep is as hairy as the goat. Sheep are distinguished from goats by the form of the horns, the presence of a small gland between the hoofs on the fore-feet, by their heavier build, by the absence of beard, and the rams do not produce the strong odour characteristic of he-goats. Sheep browse principally on grass, which they will crop very close to the ground, whereas goats will eat almost anything that is green, and prefer wandering in search of food. Indeed, only those who have kept them know, to the full, what destruction a goat can accomplish. Nevertheless, the nanny-goat is the poor man's cow, and in hilly and mountainous districts, where it would be difficult, if not impossible, to keep cows, goats are the mainstay of the family, producing milk, cheese, flesh, clothing, and serving for the draught of small burdens.

The horns both of sheep and goats are often much corrugated, and usually triangular in section, but the horns of goats rise directly upwards from the forehead and then curve backwards, and there

is no coiling or twisting, whereas those of sheep are often considerably coiled and twisted. Most English south-country breeds of sheep are hornless, but in some breeds both sexes are horned. In the Hebrides there is a race of semi-wild four-horned sheep. The South-down and Suffolk breeds bear short-woolled fleeces, but their flesh makes excellent mutton, while the Leicester and Romney Marsh sheep produce finer and longer wool, though not the same excellent quality of mutton.

There are many unobservant people living in towns, who seeing sheep only occasionally, believe that they have naturally very short tails. The young lambs, however, which delight us so much in the spring-time, have comparatively long tails, which it is the custom of shepherds to cut off when the lamb is a few weeks old.

Sheep and goats are both climbers by nature, but the goat is the greater expert of the two. Solomon, long ago in Proverbs, xxx, v. 31, drew attention to the admirable agility of the goat :

“ There be three things which go well, yea, four are comely in going ; a lion which is strongest among beasts, and turneth not away for any ; a greyhound ; an he-goat also ; and a king, against whom there is no rising up.”

There is no trace of any native wild goat in England, but they have been domesticated since the Neolithic period, and these domestic goats are said to have been bred from the Persian wild goat. It was from the stomach of this goat that a secretion was procured, known as “ bezoar stones ” or bezards,

which were famous in Persia as a cure for poison, and their reputation spreading westward, the demand was supplied by concretions from the intestines of other animals, especially the llama.

Goats are mountain-loving creatures, and we find them inhabiting most of the mountain ranges of the



FIG. 52.—The Sable Antelope. (Photo. from life.)

northern hemisphere. There are ibexes in the Pyrenees, the Alps, the Caucasus, and the mountains of Crete, Palestine and Afghanistan.

The collection of sheep, goats and antelopes from various localities exhibited in the Zoological Gardens, London, always affords ample opportunity for studying the distinctive features of these three nearly allied groups of animals.

The chamois, which inhabits the mountains of Europe, is a goat-like antelope, while the gazelles are true antelopes.

Antelopes are the oldest of the three groups dating from the Miocene. They are now limited in range to Africa, where they are most abundant, Europe and Asia. The new coat of arms for the State of South Africa has for its supporters two antelopes, the characteristic animals of the country. When looking at any collection of antelopes one cannot fail to pause to consider the form of the *Gnus*, which are natives of South Africa. They have the quarters, neat legs, tail and mane of a well-shaped pony, but their hoofs are divided. The shoulders are ungainly, the horns are oxen-like, and their heads are peculiar to themselves. Their form is such as to suggest that they might be made of service to man, but they are quite untameable in disposition.

Dr. Chalmers Mitchell also tells us that the fallow deer which formed part of the daily provision for King Solomon's table (I Kings, iv, 23) were really hartebeests, the original word having been erroneously translated.

Camels and Llamas.

When studying the even-toed ruminants it is impossible to omit a word or two about camels, which animals, strange to say, are not known to exist in a really wild state. The so-called wild camels, of which there is a small herd in Spain, are derived from individuals which have escaped domestication.

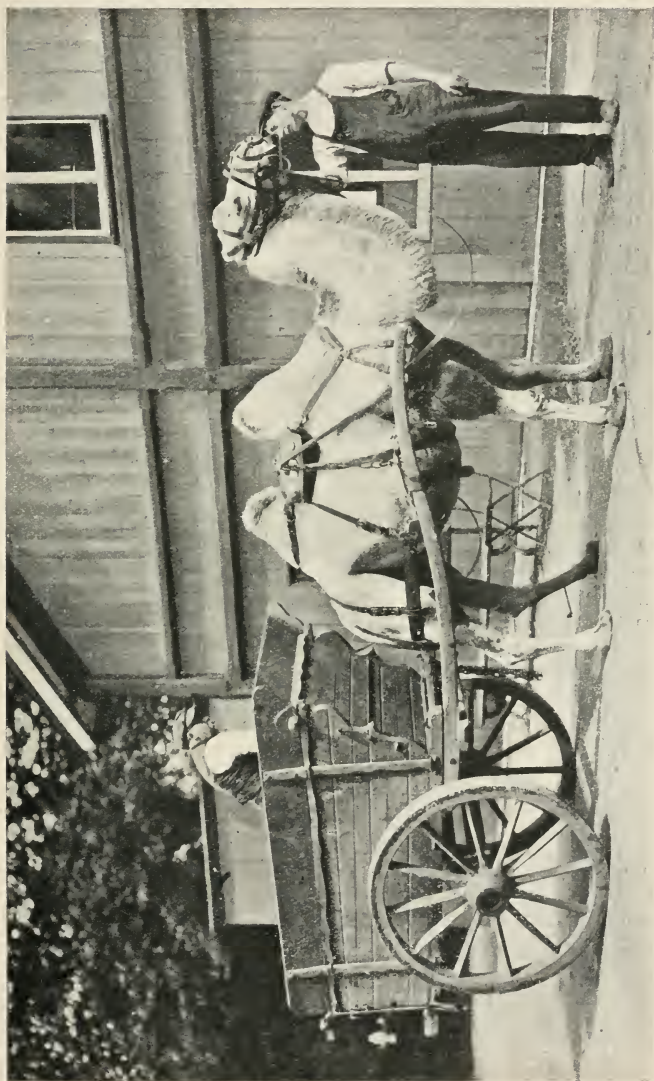


FIG. 53.—The Bactrian Camel (*Camelus bactrianus*). (Photo. from life by Partridge's Pictorial Press.)

Two kinds of camels are known to us, the shaggy-haired, two-humped Bactrian camel, which is able to endure the severe cold of Central and Eastern Asia, and is the main means of communication between China, Tibet, and Kashmir, and the one-humped camel or dromedary, the "ship of the desert," which is accustomed to a warm climate. The one-humped camel is to the peoples of the dry and sultry deserts what the reindeer is to the peoples of the icy north. Both camels digest and thrive upon the poorest food, and they have the power of storing water in their stomachs for use when needed. There are but three chambers to their stomachs, the second chamber or reticulum being a mere vestige, but there are in the walls of the rumen little pits with narrow mouths. Around each mouth there is a band of muscle called a sphincter muscle, which contracts and closes the pit when it is filled with water and relaxes when its contents are needed in the process of digestion. These pits are called "water cells," and are well filled by the camel whenever an opportunity for drinking occurs. There are many extraordinary adaptations to environment to be met with in nature, but none perhaps more striking than this adjustment of the internal economy of the camel to the arid districts with which it is associated.

Camels are restricted to the Old World. Their representatives in the New World are the llamas of South America. Of these there appear to be three varieties, the llama, the alpaca, and the vicuña. All produce hair and wool, which are extremely useful in the manufacture of cloth. They were also



FIG. 54.—The Dromedary (*Camelus dromedarius*) and Foal. (Photo. 'Partridge's Pictorial Press.')

once valued for the concretions found in their intestines known as "bezoar stones" or "bezards."

The camel is an animal of the plains, while the llama is a mountain animal. Llamas are tamed and



FIG. 55.—Llama (*Lama glama*) and young. (Photo. from life.)

domesticated, but they are peculiarly irritable animals, and will not only spit saliva, but the partially digested contents of the stomach, at anyone who annoys them.

CHAPTER X

ODD-TOED UNGULATES (PERISSODACTYLA)

THE living members of this group of Ungulates are the tapirs, rhinoceroses, and horses. Sir Richard Owen gave them the name of "Perissodactyla" or "uneven-fingered," because of the structure of their limbs, which are symmetrical to an axis passing through the middle finger or third digit, and this digit is larger and more prominent than any of the others. In all existing Ungulates the thumb or first digit is completely suppressed, and the limb is entirely supported on the nails of the fingers and toes, which have become enlarged to form hoofs. In the *Equidæ*, or horses, zebras, and asses, the third digit is the only functional toe, the second and fourth digits being reduced to splint bones.

TAPIRS.

Neither the tapirs nor rhinoceroses can be said to be common animals, but they are specially interesting to us as very ancient connections of the horse family, because they are among the oldest existing forms of mammalia, and because of the peculiar structure of the nose and upper lip, which forms a short trunk, similar to that of the elephant.

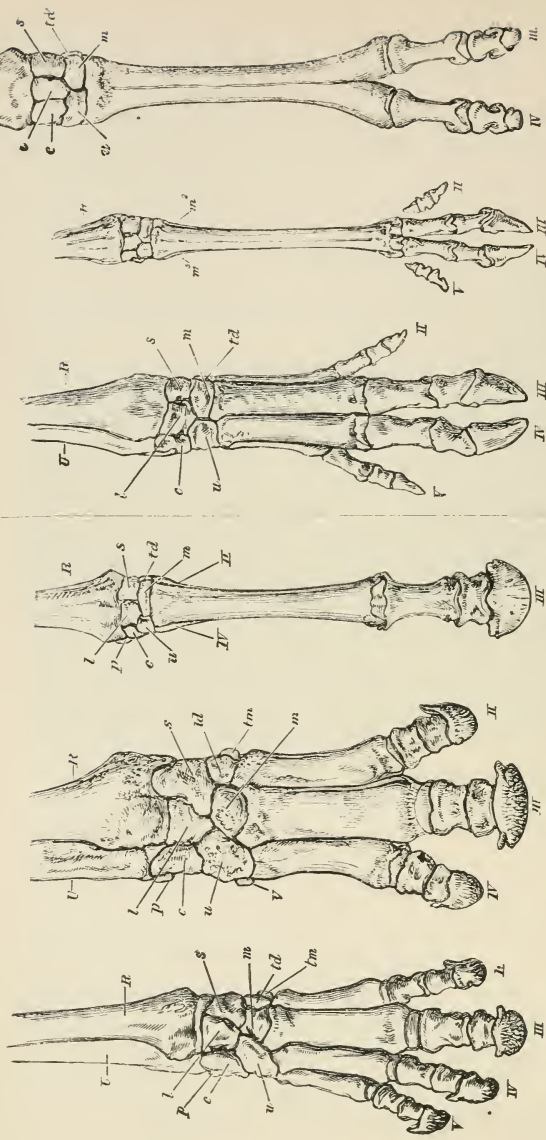


FIG. 56.—A. Bones of the manus of Tapir (*Tapirus indicus*); $\frac{1}{5}$. B. Bones of the manus of Rhinoceros (*Rhinoceros sumatrensis*); $\frac{1}{5}$. C. Bones of the manus of Horse (*Equus caballus*); $\frac{1}{5}$; II and IV, rudimentary metacarpals. D. Bones of the manus of Pig (*sus scrofa*); $\frac{1}{5}$. E. Bones of the manus of Red Deer (*Cervus elaphus*); $\frac{1}{5}$. F. Bones of the manus of Camel (*Camelus bactrianus*); $\frac{1}{5}$.
(From 'Flower's Osteology,' by permission of Messrs. Macmillan & Co.)

The range of these animals is now restricted to Central and South America, the Malay Peninsula, and the islands of Sumatra and Java. In the Pliocene and Miocene periods, however, tapirs must have ranged over America, Europe, and Asia, since their fossil remains are abundant.



FIG. 57.—The Brazilian Tapir (*Tapirus americanus*). (Photo. by W. S. Berridge.)

The American tapir is brownish-black in colour, while the Malay tapir has a broad white band round the body. The young of both species are weirdly striped and spotted with white. Tapirs have black skin and very short hair. They have four toes on the fore feet and three on the hind feet, all being provided with broad hoofs. They inhabit swamps and river beds, and are peaceful vegetable feeders.

RHINOCEROSSES.

These animals formerly existed in vast hordes in Europe and Asia and even within the arctic circle. To-day they are restricted to the tropical swamps and marshes of Africa and the Indian region, and are, like the elephants, a vanishing family. The name "rhinoceros" is derived from two Greek words meaning "nose-horn," and was given them by the ancients because of the horn, which grows above the nose of these animals, and is a peculiar and distinguishing feature. The Indian and the Javan rhinoceroses, have a single horn, while the Sumatran and African species have two horns, one behind the other. These horns of unusual structure, resemble that of whalebone when examined microscopically. They are composed of long epidermic cells matted together, and are really warts which have assumed a solid and definite form, usually conical and curved backwards.

The most interesting feature to us in the rhinoceros is the structure of his feet, since it illustrates a stage in the evolution of that wonderful organ of locomotion, the horse's leg. The rhinoceros has three toes on the fore and hind feet, each provided with broad rounded hoofs. The skin of existing rhinoceroses is hairless and is gnarled and thickened and thrown into folds, forming armour-like plates, which are separated by softer skin beneath the folds. Thus, the armour-plates are movable, as if jointed beneath the folds.

The extinct northern rhinoceros is commonly known as the "woolly rhinoceros," since whole carcasses,

have been discovered in the frozen tundras of Siberia with the skin covered with wool and long hair. This rhinoceros possessed two horns, which are preserved in the frozen earth.

The “woolly rhinoceros” must have inhabited Kent and Norfolk in Pleistocene times, and at least one specimen must have wandered along what is now Fleet Street, and, dying there, left his bones to be discovered in an excavation beneath the ‘Daily Chronicle’ office.

To the horn of the rhinoceros were attributed many medicinal and other virtues, though Topsell says that they properly belonged to the horn of the unicorn.

In 1763 Dr. Brookes, writing of the horn of the Indian rhinoceros, says: “When wine is poured therein it will ferment and seem to boil, but when mixed with poison it cleaves in two, which experiment has been seen by thousands of people.” John Evelyn also wrote of a well in Italy which was kept sweet by a rhinoceros’ horn.

THE HORSES : EQUIDÆ.

The genus *Equus* includes the horse, asses and zebras. These animals are thickly covered with hair, the colour of which varies, but there is a tendency to striping with black or dark brown. The fore-limbs are supported on single toes which are enclosed in horny hoofs. All the *Equidæ* have horn-like projections on the inner surface of the fore-limbs, but the horses are distinguished from the asses and zebras by having these callosities, commonly called

“chestnuts,” on the hind limbs as well as the forelimbs. The “chestnuts” are believed to be vestiges of scent glands, which discharged an odorous fluid by the scent of which the members of a herd could recognise one another. They correspond with the glands in the feet of sheep and deer.



FIG. 58.—Nubian Ass and Foal. (Photo. from life.)

ASSES AND ZEBRAS.

The asses, as has been said, differ from the horses in the shape of their ears and tails and in having “chestnuts” on the forelegs only.

Three species are found in Asia : the kiang of Mongolia and Turkestan, the onager of Central Asia and the Kobdo onager of Western Mongolia. In

Africa there are two species : the Nubian wild ass and the wild ass of Somaliland. It is from the Nubian wild ass that our friend the donkey is descended.



FIG. 59.—Chapman's Zebra. (Photo. from life.)

Africa is the home of the zebras. There are three species: the mountain or common zebra, Burchell's zebra, and Grevy's zebra.

Chapman's zebra (Fig. 59) is striped in the same way as the common zebra, but it has also shadow stripes between the dark bands, which are clearly seen in the figure.

THE HORSE.

“ A horse ! a horse ! My kingdom for a horse ! ”

King Richard III., v, 4.

There can be no question that man owes a greater debt to the horse than to any other animal. The civilisation we have attained has been made possible because of the existence of the horse, who has been the friend, servant and companion of man from before the dawn of history both in peace and in war. Motor traction is now rapidly replacing the horse in a great many directions, and the horse is by no means the common object it was a few years ago on the streets of towns and on country roads. But, however man may improve the motor, there will always be a need for the combination of strength with intelligence, which the horse is ready to place at our service, and his power of sympathetic companionship and docility of temper will long endear him as a friend that man will find it hard to part from.

It would be impossible to attempt even a brief description of the numerous races of domesticated horses, but it is assumed that the Norwegian dun pony may be taken as the type to which Linnæus gave the name *Equus caballus*. The horse is usually distinguished from asses and zebras by the tail being completely covered with long hairs growing right up to the base. The mane is fuller; the front part falling over the forehead forms a “forelock.” The head is proportionately smaller and more graceful in contour, the ears are shorter and the feet broader. The Norwegian ponies have a dark stripe along the spine, and there is a tendency to striping on the fetlocks.

The “chestnuts” on the fore-limbs are placed upon the inner surface just above the wrist or “knee.” Those on the hind limbs are smaller and differ in

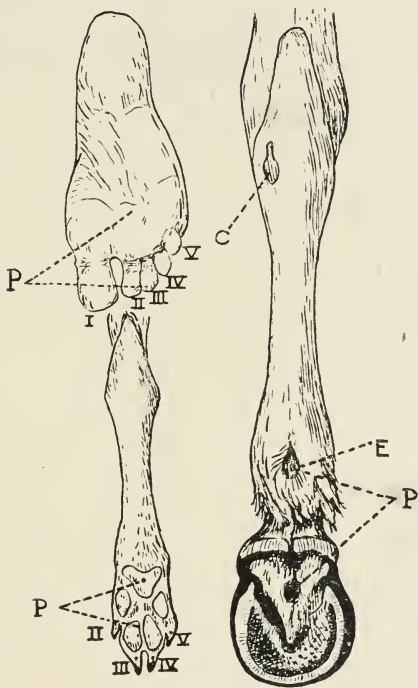


FIG. 60.—The sole of the foot of Man, Dog and Horse, showing the pads, P; C, the “chestnut”; E, ergot. (Drawn by E. Wheeler after Flower.)

form from those on the fore-limbs, and are placed below the ankle or “hock” joint.

The “chestnuts” must not be confused with the “ergots,” which are small bare patches on the hind

surfaces of each fetlock. They represent the foot



FIG. 61.—Skeletons of man and horse. (Photo. by H. C. Wood from an exhibit in the British Museum of Natural History.)

pads of the dog, and are the last remnants of the palm of the hand and sole of the foot.

If the limbs of man and the horse be compared, as is made possible now in most museums, and

especially by the excellent arrangement of these skeletons in the British Museum of Natural History, the striking modifications of the bones of the legs of the horse are realised (Fig. 61). The humerus or bone which forms the upper arm from the shoulder to the elbow is in the horse very thick and short and curiously bent. In the living horse this joint is not apparent. The forearm of man from the elbow to the wrist corresponds with the free part of the "leg" of the horse from the elbow to the "knee." In man this part of the arm consists of two bones, the radius and ulna, which are, we have seen, separate bones in the skeleton of the cat (Fig. 8). They are so formed as to slide over one another, and thus give considerable play in twisting the arm and hand. In the horse only a vestige of the ulna remains, and the wrist or "knee" is permanently fixed in the prone position. The remaining portion of the horse's foreleg represents all that is left to him of the five-fingered limb or hand of man. That portion from the "knee" to the fetlock joint consists of one central bone and two smaller bones called "splint" bones on each side of it, which in full-grown animals become united with the larger one. The cannon bone represents the metacarpal, or that part of the second finger (third digit) which is imbedded in the palm of the hand of man. The "splint" bones represent the metacarpals of the first and third fingers, the importance of which in the geological history of the horse we shall refer to later on. The fetlock and hoof represent our second finger and its nail. Similarly, in comparing the hind leg of the horse

with that of man, we find the femur or thigh-bone relatively very much shorter than man's thigh-bone, and placed like the humerus so obliquely, and the knee-joint (stifle joint of the horse) so close to the trunk that it appears not to form a part of the leg at all.

The second joint of the hind limb from the stifle joint to the hock is mainly supported by the tibia. The fibula is present as a separate bone, but is

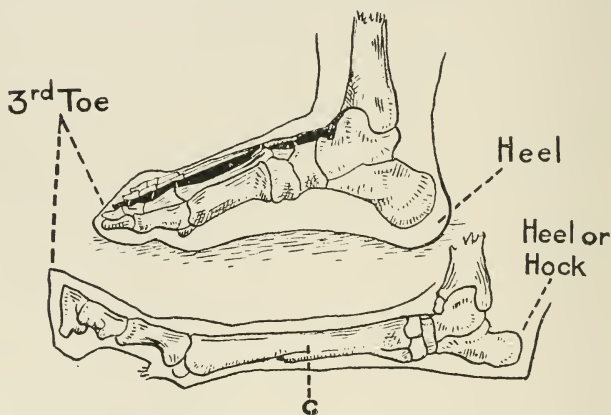


FIG. 62.—Bones of the foot of Horse and Man compared. The same bones which in man form part of the sole of the foot, in the horse form the lower part of the leg. C, the cannon bone. (Drawn by F. Wheeler after W. P. Pycraft.)

proportionally much reduced. The hock of the horse corresponds with the ankle of man, and, as in the case of the forefoot, the cannon bone with the metacarpal of the third toe, and the fetlock and hoof with the third toe itself.

The skull of the horse compared with that of man shows an enormous development of the mouth and

apparatus for mastication, while the brain case is relatively small. The teeth are highly specialised and complex with very long crowns. There are infoldings of enamel filled in with dentine and cement on the surfaces, not only of the molars, but the incisors, forming what is technically known, in the latter, as the "mark." The "mark" is a pit on the surface of the incisors which gradually becomes obliterated as the tooth wears away, therefore its presence is a guide to the age of the animal. In the adult horse there are six incisors in each jaw. Two canines or "tushes" are present in each jaw of the male only. There is a toothless gap or diastema in the jaws between the canines and the cheek teeth, commonly known as the "bar" in the lower jaw. Man has taken advantage of this natural space between the teeth for the insertion of the bit. The first of the four premolars is very much reduced and often absent. They are known popularly as wolf-teeth, and their presence is supposed to bring not only ill-luck to their possessor, but to affect his sight and otherwise injure his health, and they are usually removed by the farriers. The other three premolars and the three true molars grow close together and form a solid grinding surface, like natural mill-stones. They always maintain the same level, the teeth pushing outwards from their sockets to compensate for the wearing down of their grinding surfaces. The permanent teeth are preceded by a set of milk teeth, consisting of six incisors and six molars in each jaw. The milk teeth begin to come through soon after birth, and the young horse has his complete set of twenty-

four teeth by the end of his first year. Of the permanent teeth, the first molar appears about the end of the first year, and the second molar in the second year, these teeth of the second series being thus in place before any of the milk-teeth are shed. The rest of the permanent teeth appear in regular rotation until the full complement of teeth is acquired in the fifth year. The last teeth to appear are the third or corner incisors.

Up to the fifth year it is easy to tell the age of a horse by the condition of his teeth, and after this the age is indicated by the appearance of the "mark."

Many types of horses are commonly known, as the cart horse, the carriage horse, hunter, hackney, pony, and race-horse or "thoroughbred," but of the original wild stock, whence all these forms were derived, little or nothing until quite recently was known. As soon as man discovered the potentialities of the horse, there can be no doubt he at once set to work to domesticate it and mould it to his own uses. By careful breeding through many centuries he has produced numberless types. Sir William Flower,* writing in 1890, says: "The nearest approach to truly wild horses existing at present are the so-called Tarpan, which occur in the Steppe country north of the Sea of Azov, between the river Dnieper and the Caspian. They are described as being of small size, dun colour, with short mane, and rounded, obtuse nose. There is no evidence to prove whether they are really wild—that is, descendants of animals which have never been domesticated—or

* 'The Horse,' p. 79.

feral—that is, descended from animals which have escaped from captivity, like the horses that roam over the plains of America and Australia, and the wild boars that now inhabit the forests of New Zealand.”

In 1881 the Russian explorer Prejevalsky discovered in the Gobi desert of Central Asia a distinct species of wild horse since named *Equus caballus przewalskii*. The Tarpans had become extinct, and the natives said the pure breed was only to be found further east where Prejevalsky found them.

At first Prejevalsky's horse was regarded as intermediate between the horse and the ass, or as a hybrid between the kiang and the horse, because although it possesses the four “chestnuts” of the horse, only the lower half of the tail is covered with long hairs, as in the ass. The general colour is dun, with a yellowish tinge on the back and almost white underneath. There is a narrow dorsal stripe. The mane is dark brown, short and erect, and there is no forelock. The hoofs are narrow. The head is relatively very large and so are the cheek teeth. Nor is there any indication of a depression in the skull in front of the eye-socket, a feature to be mentioned later on in connection with the skulls of Arab horses. This Mongolian horse is now generally accepted as a truly wild horse, whence the domesticated horses of Europe and those taken by Europeans to America have arisen.

Mr. Lydekker considers that the wild Mongolian horses are the same as the Tarpans, which had crossed to a greater or less degree with escaped

domesticated horses. He also considers the Mongolian horse to be practically identical with the Cave horse. Wonderfully spirited and artistic prehistoric sketches and carvings of this horse on reindeer horn and mammoth ivory have been found in the Cave of La Madelaine in the Dordogne, in the south of France. The Cave horse had the same relatively large head, absence of forelock, erect mane and sparsely haired tail. A large quantity of the remains of horses have been found associated with those of Neolithic man and his weapons—flint knives and flint scrapers. The condition of many of the horse bones suggests that the animals had been cooked and eaten, or used for sacrifice. On counting the bones found in one locality in France, it was estimated that they belonged to at least 80,000 horses. Bones of the horse associated with human bones have been found in Kent's Cavern at Torquay.

There was no evidence that primitive man domesticated the horse until the late M. Piette discovered in the Cave of St. Michel d'Arudy a prehistoric drawing of a horse's head encircled by what appears to be a rope bridle or nose band. This drawing, with many others discovered by M. Piette, is now in the Museum of St. Germain near Paris. From the existence of these drawings we can no longer doubt that not only was the wild European horse, which is believed to be identical with the Northern or Mongolian wild horse, hunted, killed and eaten by Neolithic man, but he was bridled and tamed by man in Europe at a time when Great Britain and Ireland were still a part of the continent, and the mammoth,

reindeer, rhinoceros, bison, aurochs, lion and bear roamed in the primeval forests.

On the early Egyptian monuments the horse is not represented, neither is there any mention of it in any document. We learn, however,* that the Asiatic conquest of Egypt by the Hyksos, or Bedouins (about 1800 ?—1350 B.C.), and the subsequent rule of these Shepherd Kings, “ was due not only to the weakness and disunion of the Egyptians, but to the possession by the invaders of a new engine of war, previously unknown to the Egyptian military system, the war chariot and its horses.” The Egyptians learned the use of horses from their conquerors, and made good use of their knowledge later, in their conquests in Asia and Africa. In a bas-relief at Thebes of King Seti I in battle reproduced by Prof. Ridgeway † we see the king in his chariot drawn by horses. The very fine relief in the British Museum tells us that the Assyrians hunted horses, and we know that the Greeks and Romans and many ancient peoples used horses. King Solomon is said to have had 40,000 chariot horses and 12,000 for war. There are traditions, too, of individual horses as of “Bucephalus,” Alexander’s horse, who is said to have saved his master’s life.

The form of many of the horses portrayed on medals, coins, and in ancient statues and frescoes tells us that they were larger, more slender and more graceful than the Mongolian horse and the horse of the Cave-men. It is believed that the northern or

* ‘The Ancient History of the Near East,’ by H. R. Hall, p. 212.

† ‘Origin of the English Thoroughbred Horse,’ p. 217.

Mongolian breed had very early in the history of the domestication of the horse been crossed with another breed, of which the Arab, Barb and Turk are the descendants. The original wild stock of the Arab or southern horse and its relations is at present unknown. Prof. Ridgeway believes that there must have been a breed of wild horses in North Africa on the plains of Lybya from which the southern breeds may have descended and he calls what is generally known as the southern type the "Libyan horse." Mr. Lydekker inclines to the belief that the southern type is related to the fossil horse of India—*Equus sivalensis*. There can be no doubt that a swifter and more graceful form of horse has been frequently imported into Europe to improve the existing breed, and that it belongs to a distinct race from the northern horse can be shown by a comparison of the skulls and by other characteristic differences.

The skull of the Arab horse invariably shows a depression in front of the eye, which is believed to represent the depression for the tear-gland present in deer and antelopes. As mentioned above, there is no sign of this depression in the skulls of the Mongolian and Cave horses. It is interesting to note that the skulls of many of the more highly bred European horses, known to have Arab or Barb blood in their veins, such as the English "thoroughbred" and the old English black or shire horse, all show this depression in front of the eye-socket. Further, the facial contour of the Arab horse is sinuous, while the northern horse is hammer-headed and the facial outline has a tendency to convexity.

The old English black was the powerful war horse of the Middle Ages which carried the knights in armour.



Fig. 63.—The Cart Horse. (Photo. by F. W. Bond.)

The idea long prevailed that an Arab horse should be white. Although grey and chestnut are not uncommon the typical colouring of the best breeds is now known to be bay with black points, and

sometimes a white star on the forehead and one or more white heels. The mane and tail are always full and long and the latter is carried proudly at some distance from the quarters. The body is well rounded and the legs are long and slender. Barbs or Barbary horses are somewhat smaller than Arabs and have very fine heads. They vary in colour, but blacks and chestnuts are said to be the best.

“The King, sir, hath wagered with him six Barbary horses.”

Hamlet v, 2.

That good horses were held to be of vital importance is shown by the enactments made by various sovereigns for improving the breed. Henry VII and Henry VIII forbade the export of English horses, and Henry VIII amongst other regulations enacted that all prelates and nobles whose wives wore French hoods or velvet bonnets should maintain stallions of the required standard. Some soils and climates would seem to be especially adapted to breeding good horses. For instance, Irish horses are everywhere regarded as the best of their kind in the world. A distinct kind of cart-horse known as the “Suffolk Punch” is bred in that county, and the “shire horse,” a descendant of the old English black, is bred in the shire counties in Central England.

Chaucer describes some of the horses on which the Canterbury pilgrims were mounted, and tells us that the wife of Bath—*

“Up-on an amblere esily she sat.”

Ambling horses were considered to have an easy

* “Prologue,” l. 469.

pace and therefore to be more suitable for ladies to ride. We find in "The Extracts from the Household Book of the Lord North"* the following item:

"1581, Nov. 20. Making a horss amble, . . . xiijs. iiijd."

Ambling horses, says Dr. Bateson,† "move the two legs of the same side of the body together or nearly so, while in trotting the fore leg of one side moves almost with the hind leg of the other." The same author considers that amblers or pacers are born and not made, though he says "horses may be trained with more or less success to adopt either gait, but the distinction between natural pacers and natural trotters is a fairly sharp one."

Hobbies were bred in Ireland. They were small, docile, and for the most part amblers, and therefore regarded as pleasant to ride.

English race-horses or thoroughbreds are a distinct breed, which has been established within the last hundred and fifty years, and is the result of the interest in horse-racing, which arose in the time of James I, and increased greatly after the Restoration under Charles II. Arab horses had been frequently imported to improve the breed, but Charles II sent his Master of the Horse, Sir John Fenwick, to the Levant to purchase both mares and horses. One of these mares, the "Why Not" royal mare, is in the pedigree of "Eclipse," from whom most of our modern race-horses are descended. He had also in his pedigree several notable Barbs, Turks, and Arabians, the most famous

* 'Archæologia,' xix, 301,

† 'Mendel's Principles of Heredity,' p. 32.

of which was his great-great-grandsire the "Darley Arabian." "Eclipse" was bred by the Duke of

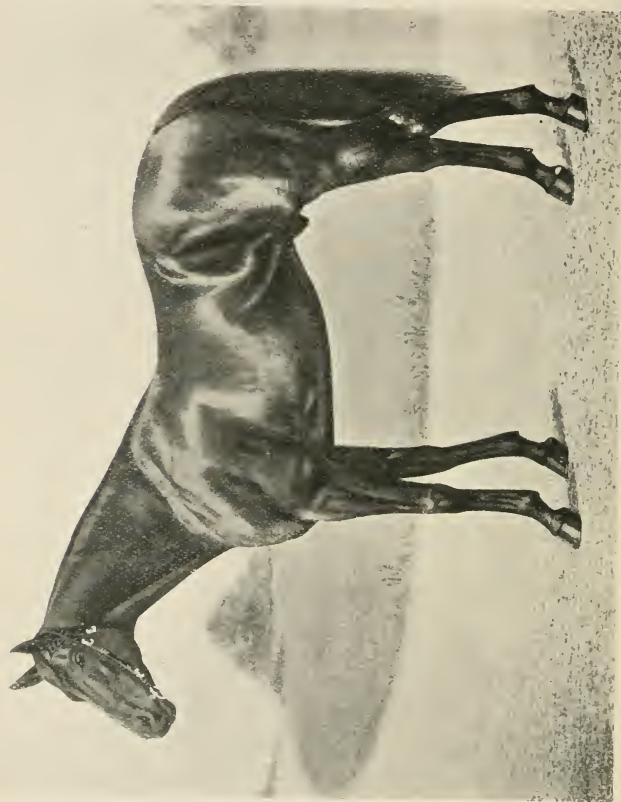


FIG. 64.—"Persimmon," the property of H.M. King Edward VII, winner of the Derby, 1896. (Photo. by Clarence Hailey, Newmarket.)

Cumberland in 1764, the year of the great eclipse of the sun. He was a chestnut with a white blaze on the forehead and one white foot. He ran in

eighteen races and was never beaten, and died in 1789.

White horses have been considered sacred by many nations from east to west. The sacrifice of white horses and divination by means of horses were features of the religion of the Teutonic and Scandinavian peoples.

The first use of the horse was for war, attached to a chariot, which served only to carry the warrior to the place of battle. Later, the chariot was armed with scythes and other weapons, and itself became an engine of war. It was not till a later period that the horse was ridden. The ox was used in agriculture, and especially for ploughing, until the Middle Ages. The representation of a horse drawing a harrow in the Bayeux Tapestry (about 11th century) is said to be the earliest record of such a use of the horse.

The fossil remains of horses, which are abundant in the tertiary deposits of Europe, Asia, North Africa, and North America, have enabled geologists to work out the evolutionary history of the horse in greater detail than that of any other mammal. The close analogy of the limb bones of the horse with those of man suggests that it must have descended from an animal with five-fingered limbs. The splint bones, to which reference has been made above, have indeed occasionally been known in existing horses to bear toes, which would correspond with the second and fourth digits of the five-fingered limb. Cæsar* is said to have ridden on a horse with three toes, and

* Pliny, 'N. H.,' viii, 42,64.

a three-toed horse was running in the streets of London in a butcher's cart not many years ago. The remains of three-toed horses are found in the Pliocene of Europe, Asia, North Africa, and America, and specimens have been discovered of the three-toed horse *Hipparion* in the English Red Crag. The side toes of these horses were diminutive and did not touch the ground, like the petti-toes of the pig. The horse of the present day is a larger animal than its ancestors; the links in the chain gradually become smaller and smaller, as they are more remote.

In the Miocene and Oligocene both of Europe and America horses are found of smaller size than the Pliocene horses with longer side toes, which would have reached the ground and been functional. The teeth, however, of these animals are not so highly specialised. They serve to connect the Pliocene three-toed horses with the lower Eocene *Hyracotherium*, an animal found in the London Basin, about the size of a fox with a separate ulna, and four spreading toes on the fore-foot and three on the hind foot. At a still earlier period at the base of the Eocene both of Europe and America is found a small five-toed animal, *Phenacodus*, which may be regarded as the ancestor not only of the horses, but of all the Ungulates.

The American series, which has been worked out by Prof. Osborn, is more complete than the Old World series, because the old world three-toed horse, *Hipparion*, is not considered to be on the direct line, by reason of its larger size and other specialisations. We have, therefore, still to find an Old World link

between the fossil one-toed horses of Europe and Asia and the four-toed Hyracotherium.

The American series is briefly represented by—

L. Eocene	Phenacodus	5-toed
Wind River, Wyoming.	Protorohippus	4-toed
Oligocene	Mesohippus	3-toed, with a suggestion of a fourth toe on the fore-foot.
Early Pliocene	Protohippus	3-toed
Pleistocene	Pliohippus	1-toed

Fossil one-toed horses have also been found in South America, which, though small of stature, have a curious conformation of the skull indicating that they possessed extraordinarily long noses. The hoofs of these animals have been found in Argentina in a comparatively fresh condition, and it is considered possible that they may have been living in 1530 and, if so, were probably the wild horses alleged to have been seen by Cabot.

Finally we may say with Prof. Ridgeway that “all the races which have in their turn held the mastery in Asia, Africa and Europe, have owed the extension of their power, or preservation of their liberty, to the possession of horses, whether they were Egyptians, Syrians, Libyans, Medes, Persians, Scythians, Macedonians, Carthaginians, or Numidians; that the lack of horses till after the conquest of Gaul was the great weakness of Rome; that the acquisition of the horse by the Arabs was a main factor in the spreading of Islam; and that had not the Franks owned good horses by 732 A.D. Western Europe might have been enslaved by the Saracens; that the possession

of horses enabled the Normans to conquer at Hastings, and the possession of great war-horses was the sure means of preserving one's own country or conquering that of others throughout the middle ages ; even when armour was discarded the new cavalry mounted on light horses became an engine of war more formidable than any yet known, whilst Marlborough's great victories were largely due to his cavalry. With the improvement of fire-arms and the ability of infantry to resist cavalry it seemed as though the days of the horse soldier were over, but the recent war in South Africa has shown that in the future struggles of the nations mounted infantry are likely to play an all-important part. Accordingly though the place of the horse under the carriage, the omnibus, the waggon, and even the plough itself may be taken by automobile engines, never in the history of the world was there greater need of horses to draw artillery and carry infantry."

FINIS.

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